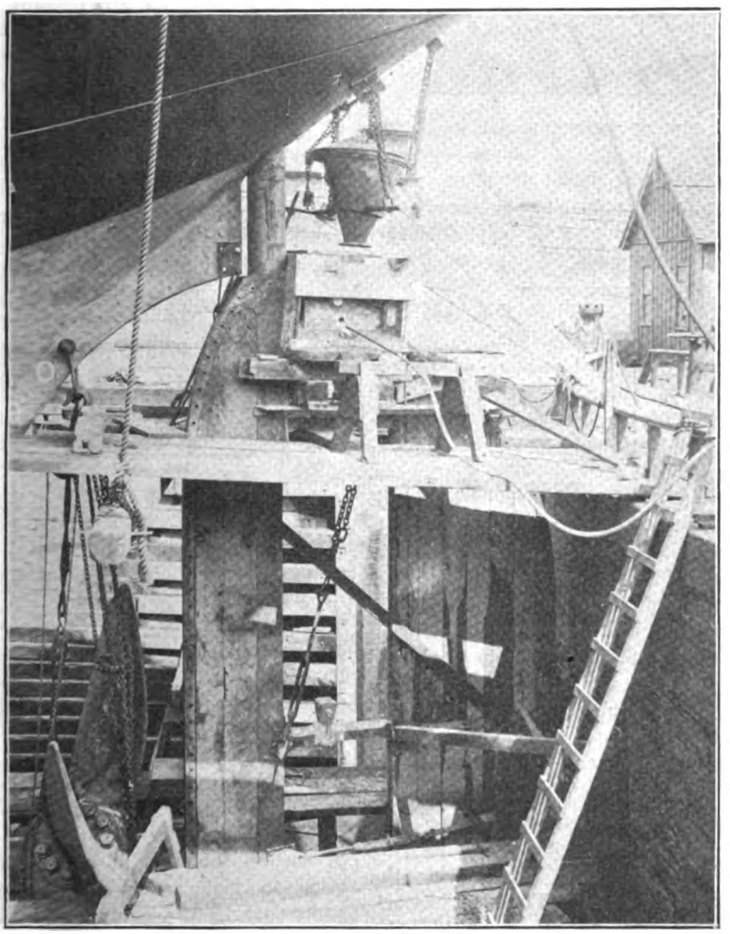
THE MARINE REVIEW

VOL. 38. CLEVELAND, JULY 2, 1908. NEW YORK No. 1

QUICK REPAIR TO A RUDDER FRAME.

At the yards of the American Ship Building Co., Cleveland, a notable rudder frame repair was recently made by the Thermit process on the steamship D. R. Hanna, of the Pioneer Steamship Co. The rudder frame was broken in two places, one break being in the center brace, about 17 in. from the post, the second break being in the bow, about 15 in. from the post. The section at the fracture of the first break was, approximately, 3¼ in. by 8 in. in area, and of the second break, 4 in. by 10 in. The Thermit welds were made with the rudder in place, the weld in the center brace being made first.



STEAMER D. R. HANNA—FINISHED WELD ON CENTER BRACE AND MOLD BOX, CRUCIBLE AND TRIPOD IN POSITION FOR WELDING.

In preparing for the weld in the center brace a space of 1 in. wide was opened up along the fracture, the fracture in the bow being opened up to 1½ in. In constructing the molds, a collar of yellow wax, 6 in. wide and ½ in. thick at the midde ordinate, was shaped about each of the fractures. A sheet iron mold box was then placed in position and filled with molding material consisting of 1/3 fire clay, 1/3 fire brick and 1/3 fire sand, provision being made for a narrow gate and large riser. A small hole at the bottom, to permit the wax to escape when heated, was also provided for in the mold.

STEAMER D. R. HANNA—SHOWING FINISHED WELD ON BOW, HOLES DRILLED IN RISER PRELIMINARY TO REMOVING SAME.

When all preparations were made the flame of a powerful compressed air gasoline torch was directed into the lower hole, melting the wax and bringing the sections to be welded to a bright red heat. The time required for this amounted to 2 hours in the case of the center brace, and 1½ hours for the fracture in the bow. While the heating was in progress, a crucible, containing the welding portion of Thermit was suspended over

191970

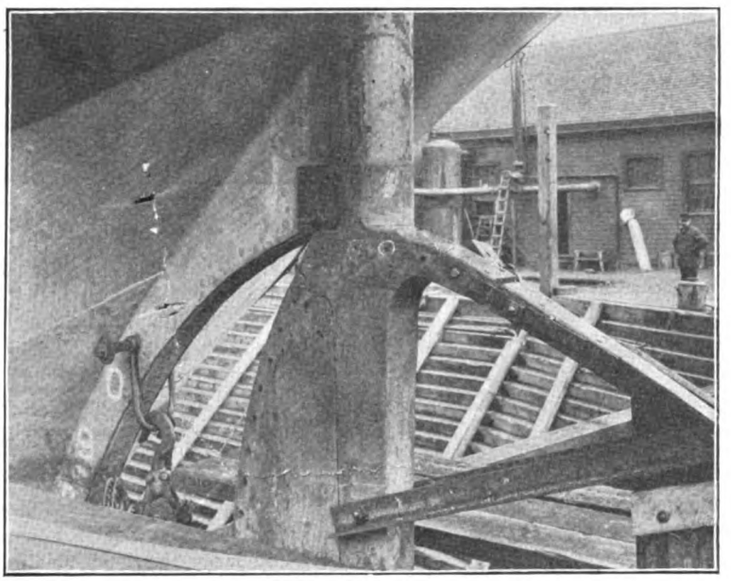
Generated on 2024-08-28 16:17 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google

Digitized by Google

Original from UNIVERSITY OF MICHIGAN

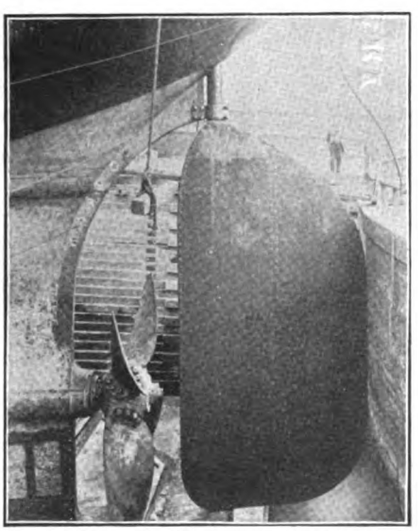
3493

the pouring gate of the mold, and, as soon as the sections were red hot, the torch was extinguished, the preheating hole plugged with a dry sand core, and the Thermit in the crucible ignited. The superheated Thermit steel, produced by the reaction in the crucible, was then tapped into the mold, filling the space formerly occupied by the wax.



STEAMER D. R. HANNA—FRACTURE IN BOW OF RUDDER FRAME.

For the center brace weld 200 pounds of Thermit, 40 pounds of mild steel punchings, and 3 pounds of metallic manganese were used, while for the smaller weld 150 pounds of Thermit, 30 pounds of punchings and 3 pounds of metallic manganese were required. An important feature of this repair was the rapidity with which it was effected, the total time required for preparing and making the welds, complete, amounting to only two and one-half days. The repair was executed by the Goldschmidt Thermit Co., of 90 West street, New York.



STEAMER D. R. HANNA—COMPLETED JOB WITH RUDDER PLATES IN POSITION.

LLOYDS REGISTER OF AMERICAN YACHTS.

The sixth annual volume of Lloyds Register of American Yachts for 1908 is now ready for delivery to subscribers. The book, which shows a material increase in size over last year, has been thoroughly revised in all particulars; especially in those relating to the engines of the rapidly growing fleet of cruising launches.

There are listed a total of 3,670 yachts, both sail and power, owned in the United States, Canada and the West Indies, with a total of some 3,500 yacht owners. The color plates give 2,013 private signals of American yachtsmen and the burgees of 365 yacht clubs.

One of the most interesting features of the book as showing the growth of American yachting, is the list of yacht clubs. The first American yacht list, published in 1874 by the late Neils Olsen, listed a total of 32 yacht clubs, and the greatest number listed prior to the establishment of Lloyds Register of American Yachts was about 170. Lloyds club list has grown steadily since 1903 until it has now reached a total of 386 clubs distributed in all parts of the United States and British North America. Not a few of these clubs have been established during the past winter.

This great increase is made up in three ways: First, of yacht clubs established in new localities, as in the states of Washington and Oregon, in British Columbia and in Southern California; second, of new clubs established to meet the recent growth of the sport in localities where many clubs already exist, as in the vicinity of New York and Boston; the friendly rivalry apparently benefiting both old and new. The third class of clubs, a large one and distributed in all parts of the country, is made up of the so-called "power boat," "motor boat" and "launch" clubs, organized by men who had no special interest in the older forms of yachting but are enthusiasts in the cause of the modern power boat. As many of these clubs are located on narrow inland waters where sailing is out of the question, they appeal to an entirely new class from which in the future the ranks of American yachtsmen will be largely recruited.

In that long-distance cruising which is now such a conspicuous feature of modern yachting the Register will prove a most useful guide; especially in its complete details of all clubs which the cruiser is likely to visit.

TO REVISE PASSENGER STEAMSHIP LAWS.

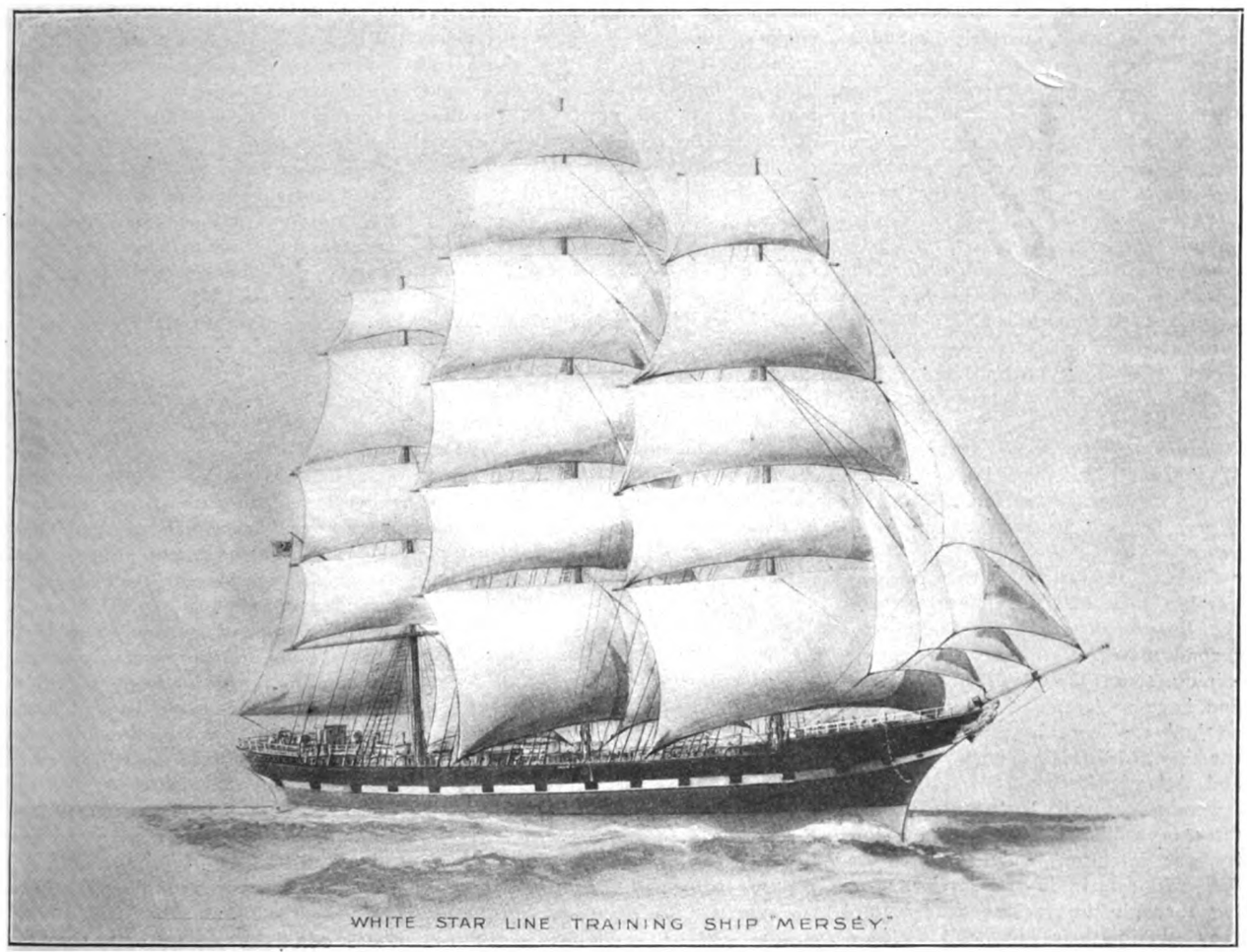
President Roosevelt has appointed a commission to examine the laws of the United States for the better security of lives of passengers and crews on board vessels with a view to their revision and to recommend such changes as in their judgment the public interests may require. The commission consists of Capt. Adolph Marix, chairman of the lighthouse board; Charles Earl, solicitor of the department of commerce and Labor; Eugene Tyler Chamberlain, commissioner of navigation; George Uhler, supervising inspector general, steamboat inspection service; and Commander Wm. Strother Smith, U. S. N. Steamship interests in general are invited to make such suggestions and comments to the commission as their experience prompts.

The new schooner Horatio G. Foss has been chartered to load a cargo of case oil at Point Breeze for Havana. The Foss was recently launched at Cooper's Point, Camden, and is the largest sailing vessel that has been built in New Jersey for years.

Generated on 2024-08-28 16:14 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

WHITE STAR TRAINING SHIP SCHEME FOR JUNIOR OFFICERS.

The White Star Line has just officially made known the particulars of their great scheme of training mercantile marine officers for the ships of their fleet and of the associated lines of the International Mercantile Marine Co. Owing to the ocean carrying trade having been largely transferred of late years from sailing vessels to steamers, and by reason of the lack of opportunities for training future officers efficiently on steamships they have devised a scheme for educating cadets as apprentices on a first class sailing vessel of a suitable size for boys to handle. They have therefore acquired the fine Clyde-built clipper ship, Mersey, which is described in Lloyds Register as follows: Length, 271 ft.; breadth, 39 ft.; tons, gross register, 1,829; ship rigged and classed A1 at Lloyds. Under the commander there will be an efficient nautical and education staff by whom the cadets will be carefully and regularly exercised and instructed, and in addition to completing their general education, they will be taught the special subjects required to qualify them for their profession. It is intended to carry about 60 boys, preference being at first given to those who have had preliminary training on the school ships Conway and Worcester. The vessel will be under the control of the White Star Line, and will trade to all ports of the world, as circumstances may render desirable, the first voyage being made from Liverpool to Sydney, New South Wales, on Aug. 20. The permanent staff of the ship will consist of commander, chief mate, first mate, second mate, surgeon, head master (nautical), assistant master (languages), carpenter, sailmaker, donkeyman, boatswain, three stewards, two cooks, three boatswain's mates as instructors, and ten able seamen for ordinary work until the cadets are sufficiently advanced to man the ship. The apprenticeship will be for four years, or three years in the case of cadets who have satisfactorily served two years on the Conway and Worcester, and after this apprenticeship, on obtaining a second mate's certificate, ex-cadets will be given the opportunity under the new board of trade rules of joining steamers of a certain size and speed, and there in due course qualifying as mate and master. It is a feature of Mr. Ismay's plan that continuation of service with the company is regarded as certain, and in view of the large number of boys who wish to join the mercantile marine, there seems to be every reason why the Mersey should from the very beginning be a complete success. The terms for their education including accommodation, food and medical attendance on board will be as under, payable each year in advance: First year, $350; second year, $300; third year, $200; fourth year, $150. The sum of $50 will be returned to the cadets on



WHITE STAR LINE TRAINING SHIP "MERSEY."

Generated on 2024-08-28 16:21 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

passing the necessary examination and holding an officer's position with one of the associated lines for three years, to the satisfaction of the managers.

In case of a youth being withdrawn from the ship, or in the event of death, desertion, or dismissal for misconduct, no part of the premium for the current year is returned.

A conduct prize valued at £10 will be open each year to boys who have been one year on board the ship, and have received not less than half the total number of marks for all subjects at the quarterly examinations.

The commander, after conferring with the head master, shall select not less than three, nor more than five of the boys whom he considers to possess the qualities for which the prize is given. He shall then submit these names to the boys who have been assembled for the purpose, and each boy who has been on board six months previously shall then vote for one of the boys so selected. The boy who obtains the highest number of votes shall receive the prize.

Cadets will be received from 14 to 17 years of age, or cadets who have served two years on the Conway or Worcester will be received up to 18 years.

On the expiration of their apprenticeship they will be eligible to pass the board of trade examination for second mate's certificate, and on obtaining same they will be qualified, and have preference for appointments as junior officers in the steamers of the White Star, Leyland, Dominion and Atlantic Transport Lines.

Promotion will be granted thereafter according to conduct and ability, the intention being that the cadets will remain in the service, passing through the various grades until they obtain their master's square-rigged certificate according to the board of trade special regulations when they will be eligible for promotion to senior officers of the watch. In school the cadets will be under the head master, and the studies will include English grammar, composition, history, geography, arithmetic, algebra, plane and spherical trigonometry, navigation, nautical astronomy, compass deviation, meteorology, marine surveying, drawing charts, ship construction and French or German.

For nautical instruction the boys will be under the commander and his officers, and will be taught knotting, splicing (rope and wire) stropping blocks, moving heavy weights, stowage and assortment of cargo, to use the hand and deep-sea leads, patent sounding machine, hand and taffrail logs, compass adjustment, use of sextant, observations of sun and stars, signalling, care and management of boats, rule of the road, fog signals, lighthouses and tides.

Lectures will be given on naval architecture construction, outfit and measurement of boats, charter-parties, keeping of log books, etc., also on the different qualities of coal, steam raising and the rudiments of marine engines, etc.

Cadets will work the ship, and in their ordinary duties will become familiar with the practical handling of the ship, making and taking in sail, repairing, bending and unbending sails, steering, etc., and will keep the necessary watches.

In port cadets will be taugh swimming, boat sailing, discharging, receiving, stowage, ventilation, and care of cargo, surveying, mooring and laying out anchors.

At sea the cadets will be divided into three watches under their officer of the watch and cadet officers, in such a manner that each watch shall have eight hours' rest each night, and in addition to keeping their four-hour watches on deck, have four hours in school or nautical instruction daily at commander's discretion.

A.

Midnight to 4 a. m.	Deck
4 a. m. to 8 a. m.	Below
8 a. m. to noon	School
Noon to 4 p. m.	Deck
4 p. m. to midnight	Below

B.

4 a. m. to 8 a. m.	Deck
8 a. m. to noon	Below
Noon to 4 p. m.	School
4 p. m. t 8 p. m.	Deck
8 p. m. to 4 a. m.	Below

C.

8 a. m. to noon	Deck
Noon to 4 p. m.	School
4 p. m. to 8 p. m.	Below
8 p. m. to midnight	Deck
Midnight to 8 a. m.	Below

These watches to be changed during the day, on the last day of each month.

School hours will be from 9 a. m. to noon and from 1 p. m. to 4 p. m., but school will not be held on Saturdays, on which days cadets will have an opportunity of keeping their personal outfit in order. In school it may be arranged to divide the pupils into a senior and a junior class, but the commander will, if practicable, take one watch each afternoon on deck for nautical instruction, according to weather conditions.

Two cadet petty officers will be appointed to each watch and a coxswain to each boat. Cadet captains of sub-divisions or watches, coxswains of boats, etc., will be chosen from boys who by their exemplary conduct and ability are considered eligible for these positions of authority.

Lists will be made out for the whole ship's company for fire and boat stations, and cadets will be exercised in fire and boat drill at least once every week.

The commander will inspect the ship each morning accompanied by the surgeon.

Divine service will be held every Sunday.

Leave will be granted to the cadets in port as the duties of the ship will permit, and according to the commander's discretion, and they must report both their leaving and arriving on board the ship to the officer in charge.

No intoxicants will be allowed on board the ship, except sufficient quantity for medicinal purposes, under the charge of the commander or surgeon.

In the home port, when not required for duty, the cadets will be under the charge and at the expense of their parents or guardians.

The cadets will be periodically examined in port, at home, or aboard, as to their progress when opportunity offers, in addition to quarterly examinations by the staff on board, and reports sent to parents or guardians. During the last year of apprenticeship the headmaster will prepare them as far as possible for their board of trade examination.

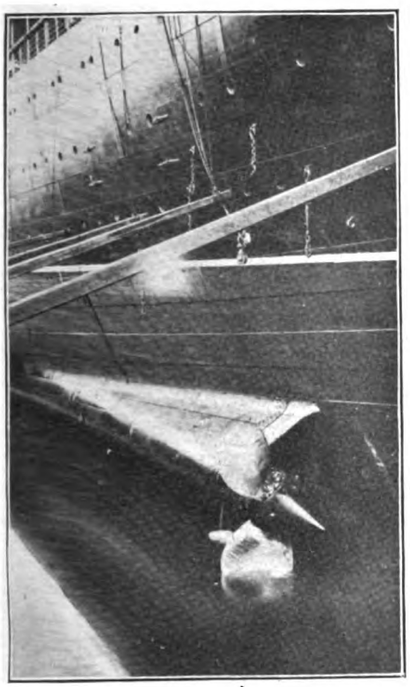
Full records of each boy's progress and marking at the regular quarterly examinaitons will be kept, which, to gether with the work books of the cadets, will be open to the inspection of an officer of the board of trade, who may at their discretion attend the examination in home ports, and report upon the efficiency of the vessel as a training ship in accordance with the special regulations.

THE MAURETANIA'S DAMAGED PROPELLER.

Shortly after leaving Queenstown on her westward voyage to New York on May 3, one of the propellers of the Cunard express turbine steamer is believed to have struck some submerged wreckage for a blade of her port propeller was found to be missing. She completed the voyage outward and home with the three propellers, and thus crippled even did between 22 and 23 knots. She was placed in dry dock on arrival in the Mersey for repairs, and held back for a week, but even this period of time did not permit of the work being completed for her keeping her

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

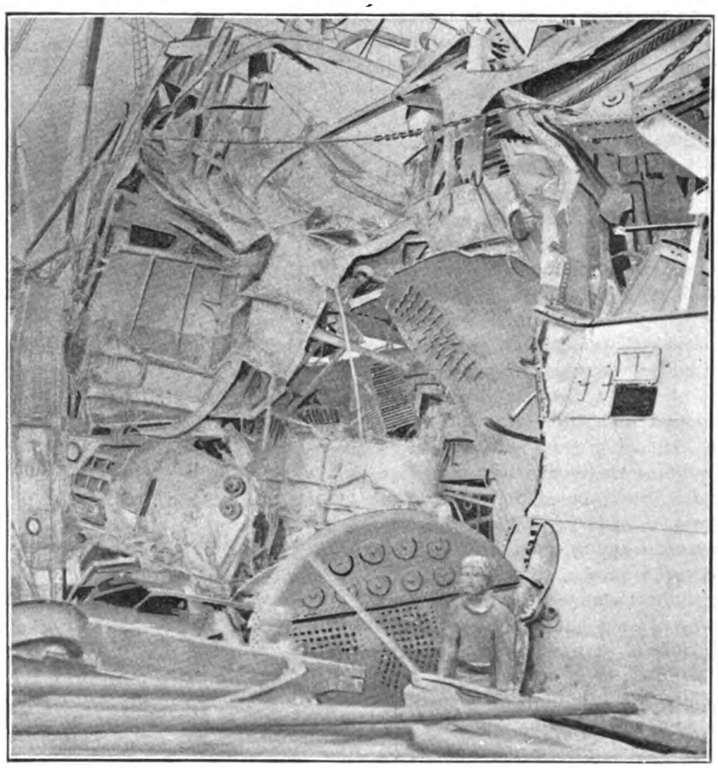
engagement to sail from Liverpool on May 27. She was therefore put on the service again and is doing the outward and homeward voyages again with three propellers. On her return to the Mersey it will then be possible to fit in the new blade, and complete the repairs that for want of time had to be held over. Our illustration from a photograph taken while the vessel was in dry dock at Liverpool shows the damaged propeller with one blade missing.



MAURETANIA'S DAMAGED PROPELLER, SHOWING ONE BLADE MISSING.

A NOVEL PICTURE OF AN EXPLOSION ON BOARD SHIP.

The accompanying illustration which is reproduced from a photograph just received from the far east gives a good idea of the disastrous effects of the explosion on board the Dutch steamer, Pahud, in which several lives were lost. It appears that on Easter Sunday last, April 19, the steamer Pahud, 1,994 tons, was lying at her wharf at Belawan, Deli, Sumatra, just completing the loading of her cargo for Batavia, when her starboard boiler blew up with a terrific report, blowing the side out, and completely wrecking the adjacent portion of the wharf, together with the shed upon it. By the latest accounts the roll of dead and missing totals 18 persons, while there are many cases of serious injury from scalding, including several members of Ott's circus company who were passengers on board. The Pahud was built at Amsterdam only two years ago, and her boilers passed the rather strict Dutch government survey only last January, being constructed to withstand a working pressure of 180 pounds on the square inch. The pressure a few minutes before the explosion was 150 pounds. The boilers, of which she had two, were of the ordinary cylindrical type, but used oil and forced draught. Among many theories to account for this alarming explosion by experts on the spot, one that finds much favor ascribes it to an abnormal collection of petrol gas in the combustion chamber exploding, causing shock and concussion to the whole boiler. It does seem strange this strong and recently tested boiler should have exploded through its own steam only. The engineers escaped, and are positive as to the pressure recorded—150 pounds on the gage, and the safety valve would blow off at 180 pounds but did not—hence the mystery. The photograph which has been handed to us by the *Liverpool Journal of Commerce* was taken by the chief engineer of the S. S. Hebe, one of the Holt Line boats, and shows the destruction caused. The Pahud, although given a heavy list, fortunately remained afloat owing to her bulkheads.



S. S. PAHUD AFTER BOILER EXPLOSION.

TRADE NOTES.

The Cleveland Pneumatic Tool Co., Cleveland, O., has just issued its new catalog H. The catalog is one of extreme interest owing to the new matter which it contains. On page 23 is given a description of the Cleveland Portable Emery Grinder and on page 33 a description of the Cleveland Staybolt chuck. Both of these machines are new and are just being placed on sale. The description given in the catalog of the emery grinder is complete. The staybolt chuck, however, has one feature of importance not mentioned in the catalog, and that is its reversibility. It reverses instantly by means of the loose roller changing position; it reverses while in action and grips the staybolt firmly in both directions. It does away entirely with the expense of squaring staybolts and the company regards it as the best article of its kind on the market. Anyone interested should write for this catalog.

A report received at the navy department states that the battleship Georgia has made the world's coaling record, taking on board 1,779 tons of coal in 5 hours and 20 minutes. During the best hour 458 tons of coal were taken on board. The Georgia is now on the Pacific coast.

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Framing of Vessels*

BY E. HALL CRAGGS, VICE PRESIDENT.

Since first I put together a few notes for this paper, I have been constrained by some of my friends who have taken a very kindly interest in its preparation, and also by the force of circumstances, to alter my plans to some extent.

I had intended to say more about the various systems of framing that have been practiced from time to time both in wood and iron ships, and in that way to trace out the history of my subject in detail. After spending considerable thought on the matter, I came to the conclusion that it would serve the objects of our institution best if I confined myself to such structures and systems as I have been intimately connected with in the drawing office of the ship yard.

When I first began to make a practical study of ships' framing, the transverse system was taken almost as a matter of course by all naval architects and ship builders. In the drawing office we were then familiar with the open floor system, varied where water ballast was required in the double bottom, by the McIntyre system; and in warships the bracket system was the most familiar one to me, though found undesirable for big cargo carriers. If we are to believe writers of ship building text books, among others, Mr. Thearle, now one of the well-known surveyors at Lloyds head office, the idea of transverse framing came directly from the practice of wooden ship building, and here my subject compels me to touch on the history of ship building to some extent. Important writers on the subject of ship building have entered their protests against blindly following a method, which, although found admirably adapted for the construction of wooden ships, of such dimensions as were generally adopted for vessels of that material, is not what one would logically expect in dealing with material of comparatively great tenacity and offering the utmost facility for joining either in the direction of its length or its breadth, such as iron and steel.

In the practice of building wooden ships, the transverse framing was obviously necessary. Generally, no attempt was made to join the breadths of planking together along the edges. On the contrary, in the operation of making the planking watertight by wedging oakum into the seams, forces were brought to bear upon the planking tending actually to open them out. As a rule, the transverse framing of wooden ships was very firmly and massively constructed and bound together by strong iron knees, the frame timbers being usually disposed room and space. It is worthy of remark that it was a common practice to allow the frames towards the extremities of the vessels to be spaced wider apart than amidships. The tendency today in steel ships is to space the frames nearer together, especially at the bow. It was thought necessary in the large wooden ships that decks should not be spaced more than about 8 ft. apart, and the influence of the practice in wooden decks is still felt at the present time; for instance, where vessels are built to Lloyds class. When I first commenced business, it was still a matter of serious consideration to leave the tier of beams out of a vessel 24 ft. in depth, and it is only really in recent years that the proper nature of compensation for leaving out another tier of beams in such a ship, thereby producing a single decker, has been thoroughly appreciated and understood. Before passing to the consideration of iron and steel vessels, it is as well to bear in mind that the thickness of planking of decks bears a very substantial ratio to the interval between the transverse supports. The builder had, therefore, no need to consider the local buckling of the planking or deck owing to longitudinal strains. In other words, the wooden vessel was relatively an incompressible structure as compared with a metal one.

We come now to the consideration of iron and steel vessels. The strakes of plating take the place of planks, with this great difference; the nature of material allows us to firmly attach the breadths of plating by lapping them and through riveting them at their adjacent edges. With a suitable arrangement, therefore, the skin of the ship can be at once brought into the transverse strength, and, in fact, can be made a very important member of the transverse girder. For the remainder of the transverse stiffening ship builders have found it convenient to follow the practice in wooden ship building as closely as possible.

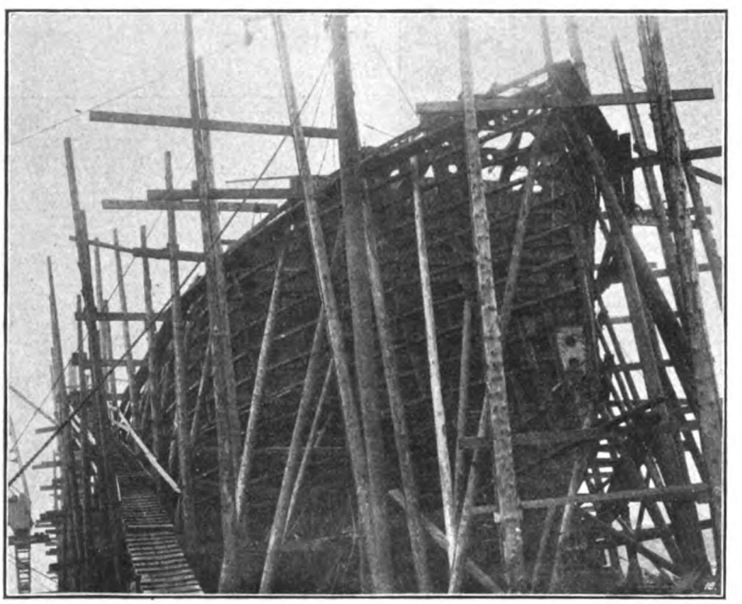


PHOTO SHOWING GENERAL ARRANGEMENT OF FRAMING OF AN OIL VESSEL, NOW BUILDING BY R. CRAGGS & SONS ON THEIR NEW SYSTEM OF SHIP CONSTRUCTION.

Coming now to the question of longitudinal strength, the analogy is not so perfect. The breadth of the metal frame sections supporting the skin is necessarily greatly reduced, and the unsupporting length between the frames is greatly increased. The thickness of iron plates, as compared with the distance between the points of support, bears a far less ratio than the thickness of the planking in the wooden vessel between their points of support, and herein I have tried to express as simply as possible the weak point of the ordinary transverse system of framing. So long as the length of vessels was kept within a moderate compass there was little trouble, but as dimensions increased, especially length, ship builders found the want of better support against longitudinal stresses. Scott Russell felt so keenly on this point that he took pains to carefully enunciate his views. In his great work on naval architecture he favored the principle of longitudinal framing. In the

*Read at Northeast Coast Institution of Engineers and Ship Builders, Newcastle-on-Tyne.

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

construction of that marvellous steamer the Great Eastern, he employed a modified system of longitudinal framing which was known as the box unit system, and depended for the continuity of its transverse strength upon a complete inner skin, which inner skin was continued underneath the principal deck so as to form a double deck. There appears to be really little doubt that Scott Russell was greatly influenced in all the details of construction of the Great Eastern by the famous civil engineer, Brunnel, who was in the main responsible for the creation of that leviathan of the deep. In practice, Scott Russell almost invariably employed the ordinary transverse system, which there is no doubt he greatly improved by his powerful advocacy of the use of iron for decks. He appears to have thought, with other designers of his day, that the great stumbling block to the adoption of longitudinal framing was a certain lack of skill in the personnel of the ship building yards. This, however, I suggest was not the real cause of his failure to introduce longitudinal framing generally. The underlying error of his attempt was surely contained in this method of endeavoring to secure his transverse strength. He actually goes out of his way to make it perfectly clear that the shell plating must not be connected with the transverse strength. He announced that the transverse strength was to be secured by means of bulkheads placed at intervals rather less than the length of beam of any ship, but he describes in detail how these bulkheads must not be carried out to the shell and riveted thereto, as the connections of the bulkhead directly to the shell might be expected to cause trouble. From bulkhead to bulkhead, bridging over a distance of about 36 ft. in a vessel of, say, 40 ft. beam (which would only be a very moderate-sized vessel indeed), he proposed to stretch his longitudinals. These were to be bound together by a series of iron hoops, fitted in short lengths between the longitudinals. It is obvious that a vessel built on this system would be of prodigious weight. With very fine model, heavy engines and boilers, and the enormous quantities of bunkers required in the time of Scott Russell, it would be a very poor cargo boat indeed. Moreover, Scott Russell's idea of making the intervals between the bulkheads corresponding to about the width of the ship, would rather appear to have been prompted by an instinct for symmetry and not deduced from exact mathematical investigation. One experiment only, I think, was made upon this system, and then it was abandoned, at which one need not be surprised.

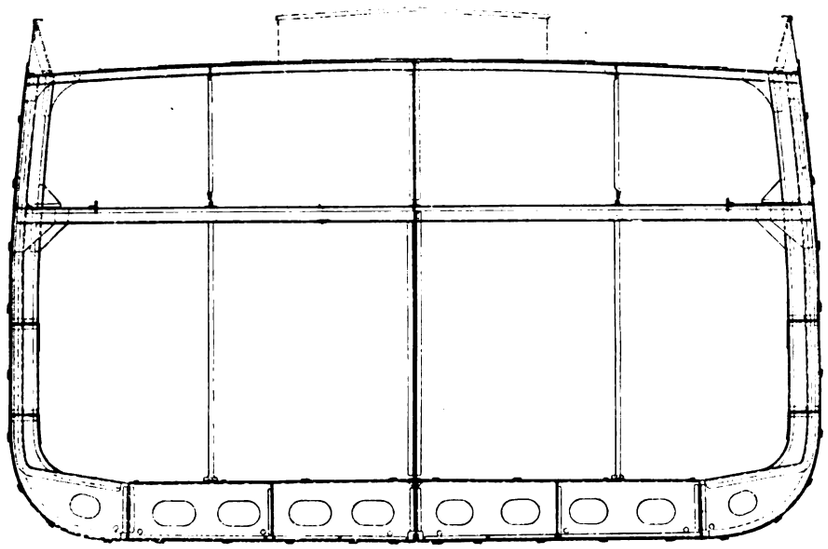


FIG. 1—LENGTH BETWEEN PERPENDICULARS, 340 FT.; BREADTH, EXTREME, 48 FT. 6 IN.; DEPTH, MOLDED, 28 FT. 3 IN.

Notwithstanding the fact that, generally speaking, longitudinal framing disappeared from practice for many years, I am sure that every student of naval architecture will freely admit with me that these two great men—Scott Russell and Brunnel—were a long way in advance of their times in their opinions as to the distribution of materials in iron vessels, and that ship building science, as a whole, owes them a deep debt of gratitude.

I need not take up your time in reciting how the first generally accepted method of compensating for the lowest deck in vessels of 24 ft. depth was by hold beams and a marginal stringer, which then gave way to web frames connected to strong beams at the next deck above, while to support the intermediate frames, intercostal stringers efficiently attached to the web frames were introduced (see Fig. 1). The intermediate frames remained of the same strength as formerly required if deck and stringer were fitted, and obviously on the removal of this support became, so to speak, weaklings, hence the necessity of supporting them at intervals by intercostal stringers attached to the web frames. I have often wondered in the drawing office why the scantlings of these frames were governed by a number obtained by the summation of the measures of the half breadth, half girth, and depth, and had so little relation to the distance between the intercostal stringers which defined the points of support of these frames. Web framed ships in their day, however, did good service, and very little fault could be found with them, if we except the

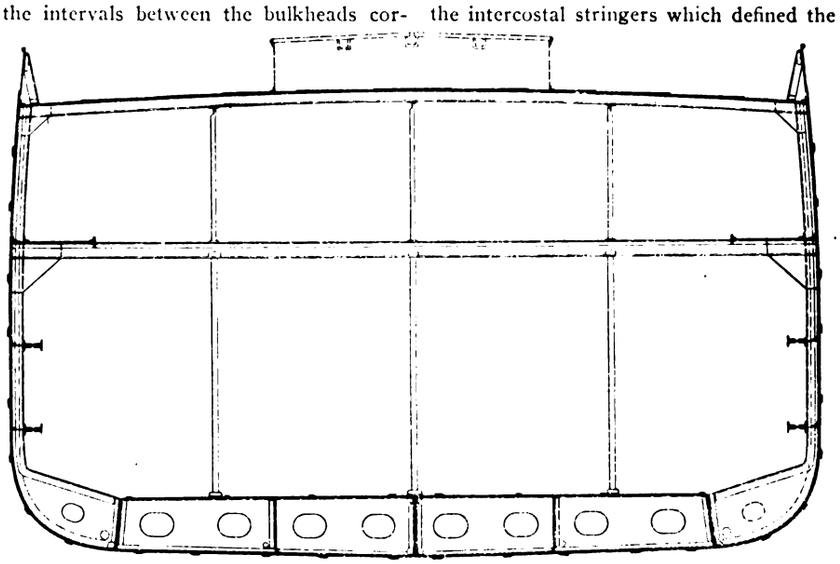


FIG. 2—LENGTH BETWEEN PERPENDICULARS, 330 FT. 9 IN.; BREADTH, EXTREME, 47 FT.; DEPTH, MOLDED, 26 FT. 6½ IN.

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

fact that not sufficient importance was attached to the riveting of the webs to the shell, and, where double bottoms were fitted, the connection at the margin plate left much to be desired. On the whole

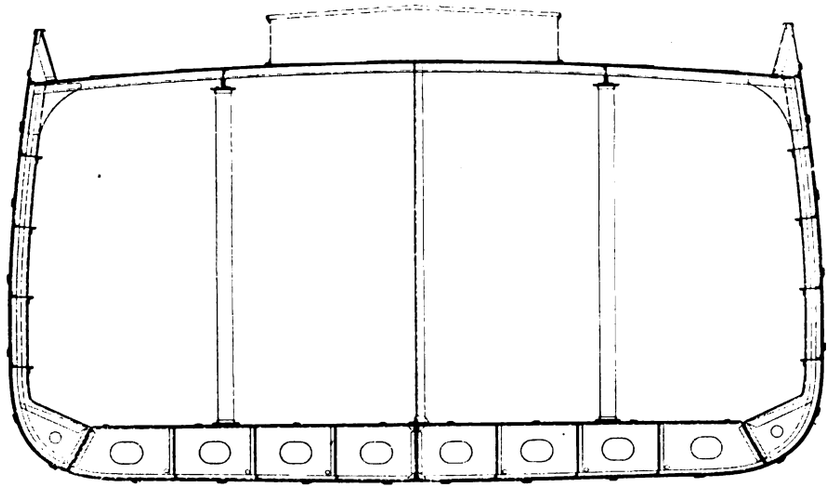


FIG. 3—LENGTH BETWEEN PERPENDICULARS, 346 FT. 6 IN.; BREADTH, EXTREME, 50 FT. 8 IN.; DEPTH, MOLDED, 25 FT. 6 IN.

we must admit that it was not sufficiently well understood that the webs, acting in conjunction with the side stringers, had to be strong enough to support all the intermediate frames. The expensive form of the riveted attachments necessary for web framing encouraged the development of the deep frame system, obviously a more scientific arrangement of material than that adopted in web-framed vessels, inasmuch as a proper frame girder is secured, and each frame in this system is able to take care of its own portion of transverse strength without borrowed support, with the exception of that obtained from the shell plating as previously explained. The increased demand for single deckers of larger size quickly brought up the question of compensating for the omission of all decks, except the upper deck, and a succession of rather extraordinary types of framing was the result, the most curious being a mixture of the web-frame system and the deep-frame system, with a tier of beams at the height of the lower deck (see Fig. 1). It is obvious, in this system, that if the web frames were of any use at all in supporting the intermediate frames, there was no reason whatever for fitting these frames according to the deep frame rule. Further, if the web frames were not strong enough to support the intermediate frames, there was no object whatever gained in fitting them, as deep frames of the same size as the other deep frames would have been efficient.

Turning back to the deep-frame system without web frames, I need not remind my hearers that a strong attempt was made by fitting H or double bulb angle stringers, with an intercostal plate riveted to the shell, to support the deep frames at intervals between the deck and floor (see Fig. 2). It eventually became obvious that this was a great waste of material, as the distance between the bulkheads was usually so great that these stringers were ineffectual as girders with such a great length, and mostly being situated near the neutral axis, were unimportant as regards longitudinal strength. Ship owners naturally objected to these serious objections in the holds, and eventually the Classified Societies, recognizing that these side stringers did not materially support the framing, reduced the dimensions of these stringers, at the same time somewhat increasing the depth of the frame girder (see Fig. 3). The attention of naval architects in single-deck ships, and vessels with deep lower holds, was then forcibly directed to the connections at the margin plate and at the beam knee, which were considerably improved.

Quickly following these developments came the demand for single-deck ships without shelf stringers or hold beams of any kind. While my firm was constructing one of these ships, materially over 24 ft. in depth, per Lloyds rules, I became greatly impressed with what appeared to me a great waste of material in the frame girder, which, in the vessel to which I refer, was 12½ in. deep by 10/20 to 9/20 in. in thickness by 3½ in. flanges and 3½ in. overlap. It appeared to me that a considerable reduction could be made in the effectual length of the frame girder, and consequently in the scantlings, and at the same time the danger existing in single-deck steamers of the margin plate cracking would be guarded against by working from the tank top as a foundation, and in curving the reverse frame gradually to a point at a comparatively great distance above the tank top. This suggestion met with such strong approval from the Classification Societies that it led to the development of what is known as the "C" system of framing, on which system my own firm has built six steamers. The frame was reduced to 12 in. by 9/20, with single attachment angles and no increase in way of long hatches. Owing to the reverse frame being secured so far inboard, there is less liability to trip and there is full justification for the omission of some of the stringers (see Fig. 4). The form of frame naturally suggested making a similar curved connection at the upper end of the frame girder (see Fig. 5), but I have never gone to the extent of curving the reverse frame into the beam knee, as sufficient recogni-

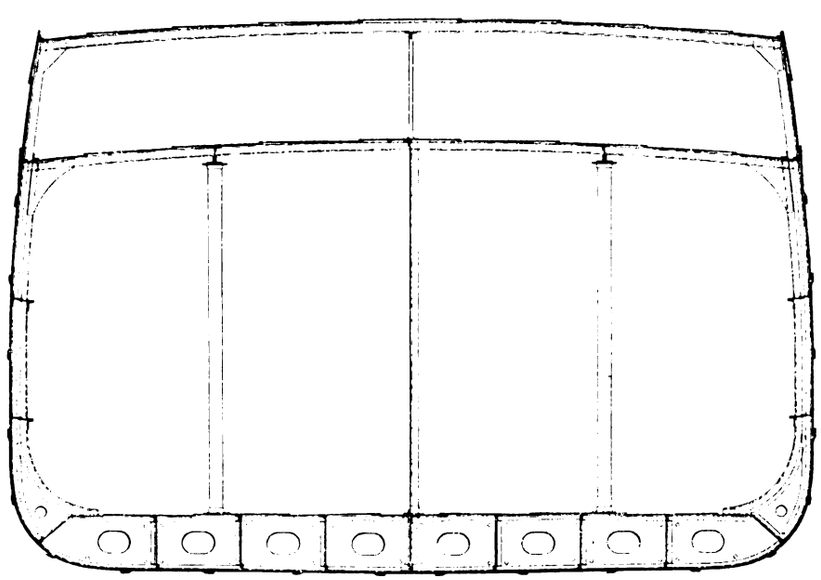


FIG. 4.

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

tion of such an improvement to justify the expense has not been given.

In the vessel shown in the diagram (Fig. 4), however, there is a very substantial saving of material, leading on the whole to a gratifying economy in construction, and increased deadweight with reduced tonnage. This system of framing has been well received by owners and their superintendents.

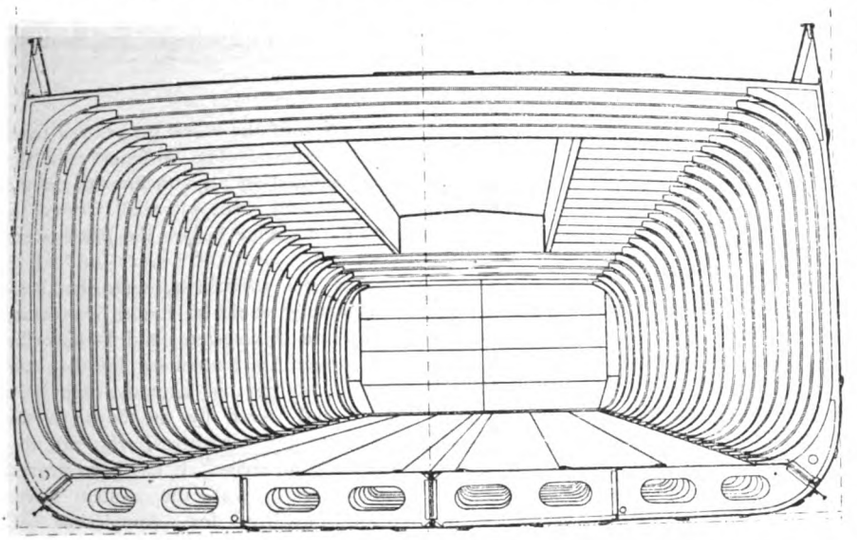


FIG. 5—SECTIONAL VIEW OF A STEAMER, SHOWING "HALL" STRINGERLESS SYSTEM OF "C" FRAMING.

The transverse system that I have referred to has given at the very best what is relatively a compressible structure lengthways. Those who have experience in ships' repairs, especially consulting engineers and superintendents, are well aware of the compressibility of the upper structures of vessels by the panting that is evident of the plating between the points of the transverse support. Since the Classification Societies introduced the system of wide spaced pillaring in connection with the girders riveted to the decks, a good deal has been done by builders adopting this system towards overcoming the compressibility of the upper structure. These intercostal girders, however, are a serious addition to the number of parts in the structure and contain a large amount of costly riveting, and, while carrying us in the right direction as regards strength, take us further from simplicity.

From the very shape of the close-spaced transverse frame, which, commencing in an ordinary cargo vessel with a riveted attachment on the keelson, advances to the bilge with several vertical riveted attachments carrying the intercostal girders; then at the bilge with an expensive attachment at the margin takes a sharp curve and extends up the side of the vessel, affording riveting attachment to the side stringers; reaches the first beam knee and sends out a branch at right angles necessitating a very heavy and expensive riveted attachment, and of which the rivets can only be fitted in after special fairing and drilling. At every deck in the ship this branching process must be repeated until it arrives at the upper deck, when the frame, with another similar riveted attachment, turns at right angles across the deck. Exactly the same number of turns, branches and riveted attachments are repeated on the opposite side of the vessel. This circuitous transverse frame must be pillared either by one, two, or three rows of pillars, and we must either put a pillar on every beam or collect the beams in groups by means of strong riveted girders, in order to open out the pillaring. It is difficult to conceive, without the minutest study in detail, what a mass of useless weight is worked up in these transverse members, for a large part in riveted attachments, which are a source of weakness rather than strength, and not a pound of which can be called upon to do service in the direction in which the most serious strains affecting a ship must be met.

I wish now to say one word more in regard to the value of longitudinal material in transverse-framed vessels. I understand that Classification Societies and naval architects generally, in calculating the longitudinal strength of vessels, assume that when the upper works are under compression, and a vessel undergoing sagging stresses (I am paying particular attention to the upper works, as herein most failures have been experienced), the value of the plating between the beams is reckoned as able to withstand a somewhat higher stress than experience teaches the material is able in order to provide a factor of safety of about 3 to 1 with a dead load. From recent causes of collapse of decks, it has been admitted that the plating between the beams has buckled under stresses of probably 12 to 14 tons, according to thickness. This assumed factor of safety, I fear, therefore, in transverse-framed vessels, is in ordinary cases non-existent, besides which it is a question whether it is safe to assume such strains as dead loads. For a number of years my firm has been in the habit of fitting some longitudinal framing underneath the midship portion of the uppermost deck in all vessels, and, in every vessel of extreme proportions, have adopted the longitudinal girders on all decks to insure increased longitudinal strength.

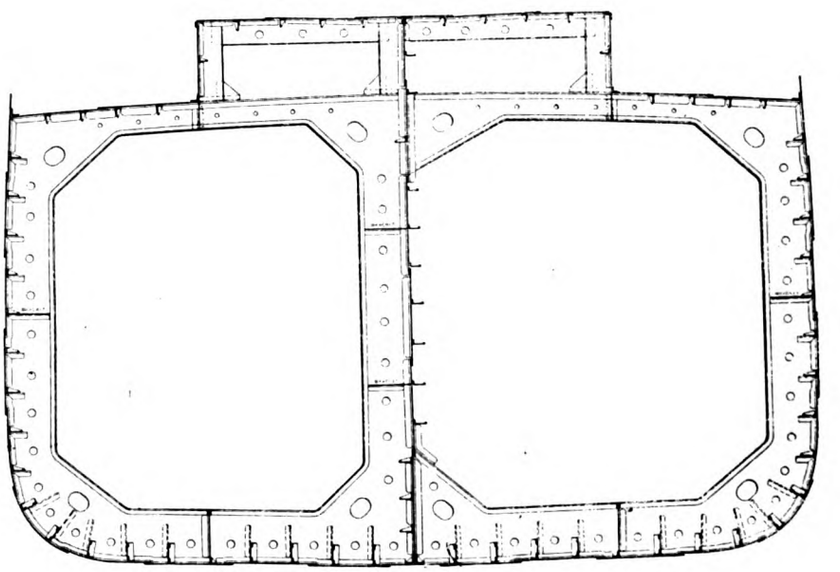


FIG. 6.

I think I need say no more to convince my hearers what my attitude has been for some years towards the ordinary

Generated on 2024-08-28 16:15 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

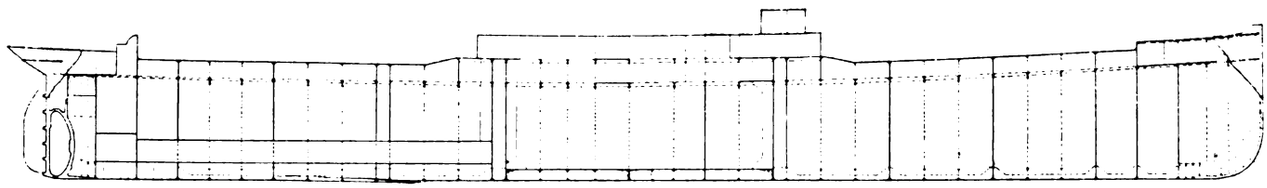


FIG. 7.

transverse system of framing, and I would add that since the first day upon which I found myself in close sympathy with Mr. Isherwood on this subject, I have not had one single moment of misgiving. I would venture to say, also, that the true guide to simplicity in a ship's structure is to take the skin framing through from stem to stern, instead of following the other tortuous route at close-spaced intervals throughout the vessel's length, leaving blanks between.

Without further remark, I will refer you to Fig. 6, illustrating the section of an oil steamer, 355 ft. in length, now being built on the longitudinal system adopted by my firm and with which Mr. Isherwood's name is associated. In this system the floors, frames, and beams are fitted longitudinally, being for the most part in long straight lengths. I would suggest that the chief merit of the system is the way in which the transverse strength has been dealt with, and I would add that this has received the first consideration. Longitudinal stiffening is for the most part woven through the transverse member in the neighborhood of its neutral axis. The transverse girders are directly attached to the shell securing the greatest possible value from the shell plating transversely. It will be seen at a glance that this reinforcement of transverse strength is obtained from the shell at the expense of very slight stress, owing to the proximity of the neutral axis of the transverse girder to the skin plating. In this oil steamer advantage has been taken of the circumstance that broken stowage is not a serious detriment with a liquid cargo, and full play has been given to the transverses as regards depth, and deep bracketing at the upper and lower parts, to reduce the effective length of girder. The longitudinal strength of frames, floors and beams is maintained while passing each oiltight bulkhead by bringing up the riveted attachments to the strength of the member attached. This arrangement lends itself to greatly improved distribution of strains round the margin of the bulkhead, and the rivets passing through the bulkhead attachments are found to be subject to a much less severe stress than has been the case in transverse-framed vessels.

The next plate (Fig. 7) is the elevation of the same steamer, clearly showing the distribution of the transverse structures, and which explains itself.

In designing the scantlings, an effort has been made to keep the stress at the bridge stringer equal to that at the stringer in way of the oil tanks. This desirable state of affairs is comparatively easily obtained by the aid of the new system.

I will next throw upon the screen a series of photographs taken of this steamer during the erection. The vessel has been brought into fair shape by templating the longitudinals and the brackets attaching them to the bulkheads. The bulkheads have been erected and riveted as the erection of the vessel progressed from aft to forward. The stiffeners and the angles connecting all attachments on the bulkheads and webs were all riveted by hydraulic machine before the plates were lifted.

It has been thought by some that serious difficulty would be found in erecting a vessel on this system, and I think the best answer to that must be that the greater part of this structure has been erected and faired by the boys, in the absence of the carpenters, who are unfortunately on strike. It has been proved by experience that the system gives unusual facility for completing all internal work as the erection advances, and this circumstance alone is having a marked influence in the direction of economy. The number of lugs and knees saved in the oil ship is very great indeed. Moreover, there is no necessity for fitting stringers, and the keelsons, with their enormous connecting knees at bulkheads, are dispensed with, their functions being more efficiently taken up by the longitudinal floors and deep transverses resulting in economy in material amounting to about 275 tons, and at the same time reduced stress on plating and riveting throughout, and consequently much less liability to leakage, and easier maintenance. The massive appearance of the structure has been the first impression of almost every practical man who has inspected.

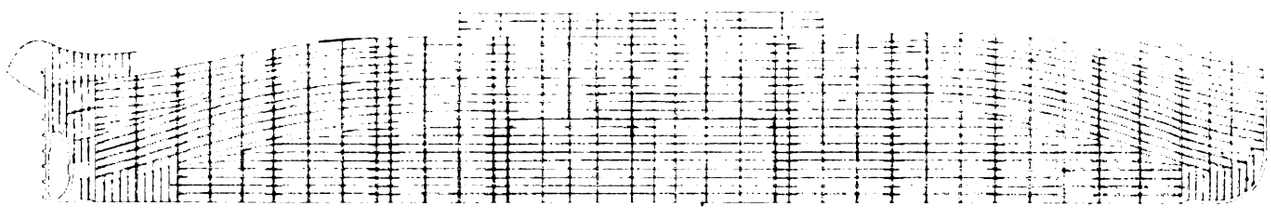


FIG. 8.

I now refer you to the framing plan

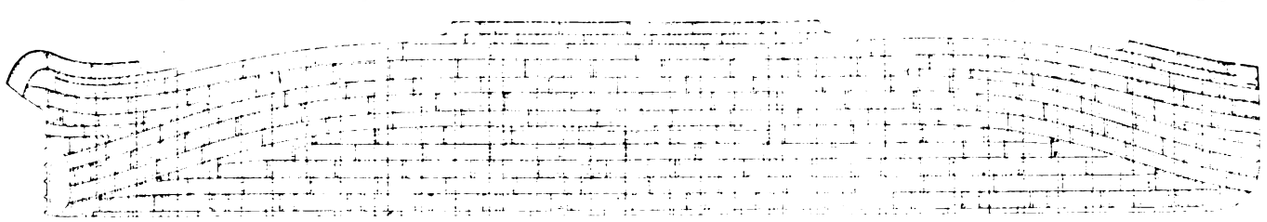


FIG. 9.

Generated on 2024-08-28 16:15 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

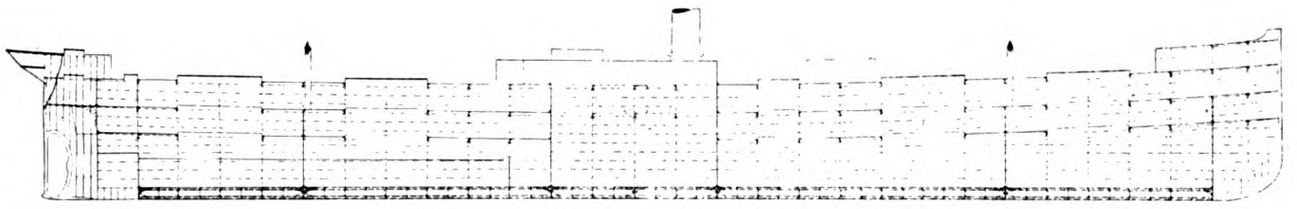


FIG. 10—LENGTH BETWEEN PERPENDICULARS, 360 FT.; BREADTH, EXTREME, 48 FT.; DEPTH, MOLDED, 23 FT. 6 IN.

(Fig. 8) which shows at a glance how the spacing of the longitudinals is preserved, and how the endings are arranged, and also the provision against panting. One remarkable feature of this plan is the great facility afforded at the ends of the vessel by using a little transverse framing. Two great authors on ship building matters have stated the opinion that a longitudinal system of

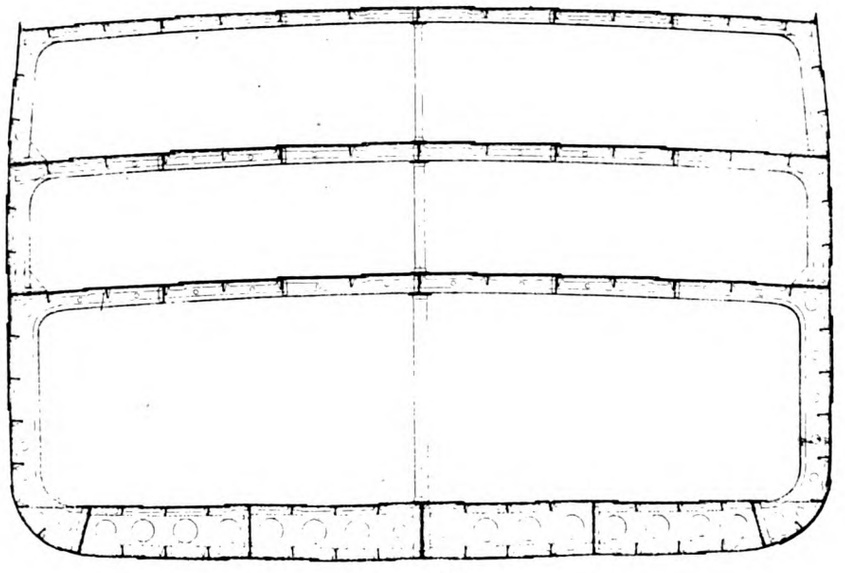


FIG. 11.

framing would be found especially useful at the extreme ends of the vessels. In actual practice, however, it has worked out quite otherwise up to the present time.

Next, I draw your attention to Fig. 9, the plating plan of the same ship, showing how, in the system of framing we are now considering by a very simple arrangement of plating, crossing and landings may be avoided almost entirely.

I come now to the view (Fig. 10) of an elevation of a shelter deck steamer, 360 ft. long, which will be the first cargo steamer constructed under the new system of framing. This view shows very clearly how the intervals between the transverses may be easily adapted to the deck and hold arrangements of such a steamer. In the present case a uniform interval of 12 ft. has been selected.

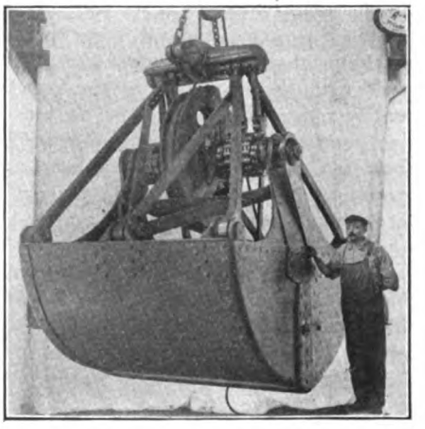
The last view (Fig. 11) to which I have to ask your attention this evening is of the full midship section of this steamer. I feel sure that the simplicity of structure will appeal to all practical men who are present tonight. The question of erection, however, will be foremost in their minds, and I have, therefore, explained that to facilitate this important part of the building of the ship, and to quickly secure the fair shape of the vessel, the transverses are erected as complete as possible. The two side girders in the double bottom and the tank side are fitted intercostally, so that the correct distance between transverses is quickly adjusted. It will be noticed that the longitudinal frames are graduated in size according to the water pressure they are required to withstand. The facilities afforded by the system to produce a design of double bottom of very great strength and durability of the internal parts is probably the most striking feature of the plan now before you. This plan has come from the drawing office, with the ink, so to speak, hardly dry, and represents the last thing that I have to say on the interesting subject of the framing of vessels.

The Armstrong Cork Co. of Pittsburg announce with sorrow the death of its president, Thomas Morton Armstrong.

The Union Iron Works, San Francisco, is to build a large dry dock at a cost of about $500,000.

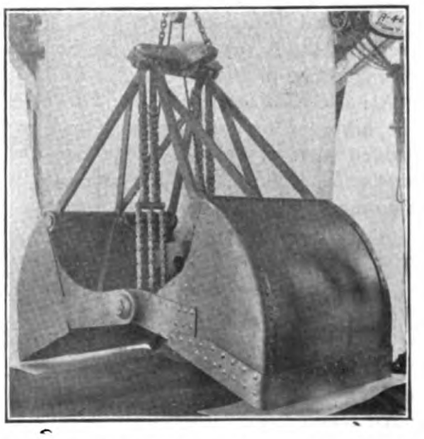
A LARGE CLAM-SHELL BUCKET.

The 7½ cu. yd. clam-shell bucket shown in the accompanying illustrations was recently built by the Hayward Co., New York, for the Illinois



JAWS CLOSED—CAPACITY 5 TO 6 TONS PER LOAD.

Steel Co., and is the largest bucket ever built in the New York district. The bucket is to be used in connection with a cantilever coaling bridge at the Illinois Steel Co.'s works at Joliet, Ill., and will be employed in reclaiming coal from the stock piles



JAWS EXTENDED, COVERING AN AREA OF 98 SQ. FT.

and feeding it through hoppers to an extensive system of belt conveyors. Its capacity is five to six tons per load, according to the position in which it is landed on the coal.

The design of the bucket through-

Generated on 2024-08-28 16:17 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

out is the usual Hayward, of the latest type, known as the 1908 Class "E" bucket. Although huge, and the amount of coal carried enormous, the power required to operate the bridge is comparatively small, due to the fact that the bucket is balanced by counterweights. When wide open the jaws of the bucket cover an area of 98 sq. ft., and its extreme height is nearly 13 ft. When closed it is so compact that it occupies a space of only 7 ft. in width, 10 ft. 6 in. in length and 11 ft. in height. The shells are built entirely of flanged steel plates, having the cutting edges protected by a continuous steel shoe cut from solid steel plate. The arms and all other parts of the bucket are of forged or plate steel, with the exception of the upper center and power wheels. The massive steel pin connections are entirely protected from wear by bushings of bronze, all bushings and journals throughout being of this material, which can be easily replaced.

The closing mechanism consists of the usual Hayward power wheel and side chains device, an interesting feature of which is the arrangement of the chains so that they do not wrap up on themselves when the bucket is closing. Each wrap of the chain lies directly on the hub of the power wheel, thus ensuring constant leverage at all times. The wire ropes used for operating the bucket, of which there are four, receive little or no wear in the wheel, the holding lines being dead-ended on the top of the bucket and the closing lines wound on an unusually large power wheel. It is impossible for the closing ropes to escape from the power wheel score, a rope guard being provided which effectually holds the rope at the bottom of the score in the wheel at all times.

A noticeable feature in the bucket is the style of bracing, which is so arranged that it is impossible for the shells or other parts to get out of alignment, and the proportion is such that the wearing qualities are not sacrificed at any point by the tremendous strength of structure, and digging power.

The increased demand for Bird-Archer boiler compound has necessitated appointing the following representatives: Chicago, the Golden Rule Oil Co., 171 Washington street, Chicago; Baltimore, the Maryland Railway & Electric Supply Co., 604 Continental building, Baltimore, Md. The Philadelphia office of the Bird-Archer Co. has been removed from 56 North Delaware avenue to 119 South Fourth street, room 511.

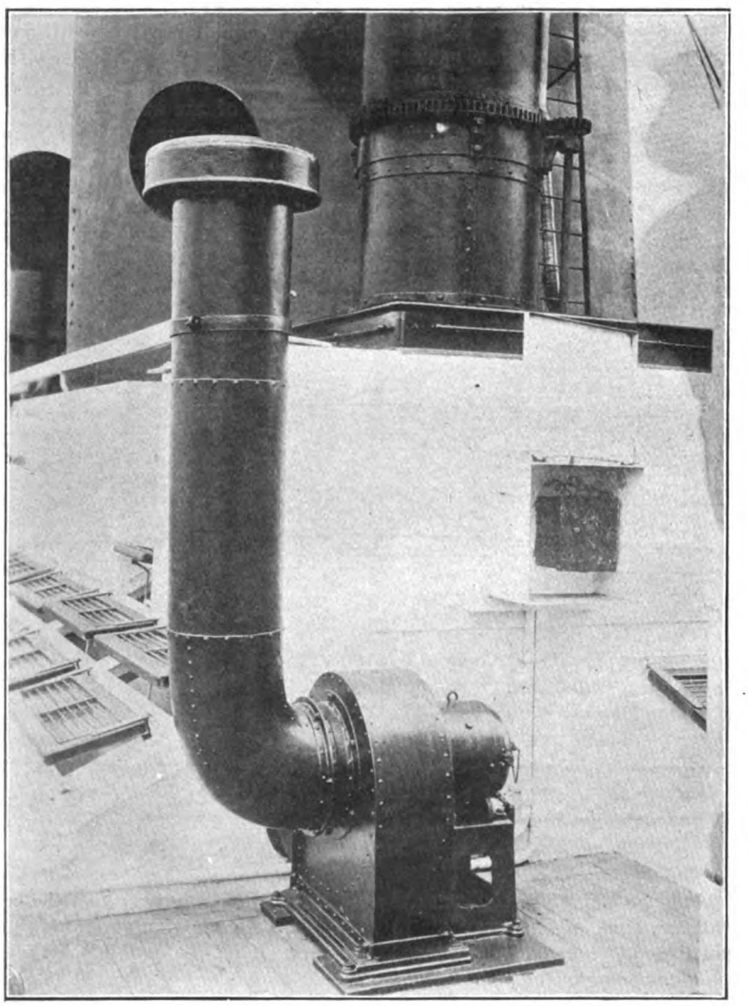
TURBINE FANS FOR USE ABOARD SHIP.

Afloat, as well as ashore, the turbine type of fan is steadily displacing the older designs. The fans or blowers that are now used in the United States, British, German and other leading navies, and on the principal ships of the White Star, Cunard, Hamburg-American, American, French and many other lines, must have features that strongly recommend them. Aboard ship, perhaps even more than ashore, the unusually large volumetric output of "Sirocco" centrifugal fans, relative to their diameter and speed of revolution, had led to their universal adoption, owing to the fact that they can be used in confined spaces where it would be impracticable to install an ordinary centrifugal fan large enough for the required duty. Roughly speaking, the saving in space is 50 per cent.

To put the matter concretely, an ordinary paddle wheel fan for an output of 20,000 cu. ft. of air per minute would have a wheel 60 in. in diameter, and, with casing, would occupy 320 cu. ft. of space, and weigh 2,000 lbs. A "Sirocco" turbine blower having the same output would occupy only 140 cu. ft. and weigh but 1,300 lbs. This shows a saving of 56 per cent in space and 35 per cent in weight.

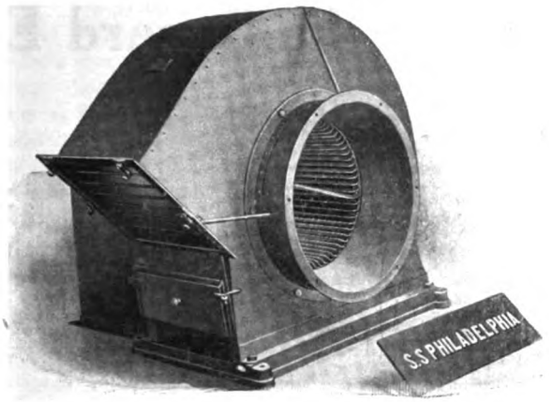
For forced draft these centrifugal fans have the same advantages as they have for ventilation and other purposes. One of the accompanying illustrations shows this type of blower installed on the U. S. N. tugboats Patapsco and Patuxent, the unique construction being a noticeable feature. The capacity of this blower is 700 cu. ft. against 1¼-in. water gage at 1,800 R. P. M., 0.22 H. P. The theory of this construction is so entirely at variance with the ideas that prevailed up to the time of S. C. Davidson's invention, that an outline of the principles of design followed in the "Sirocco" runner is of interest.

In centrifugal fans of the ordinary



SIROCCO VENTILATING FAN ON ALLAN LINER VIRGINIA.

Generated on 2024-08-28 16:20 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

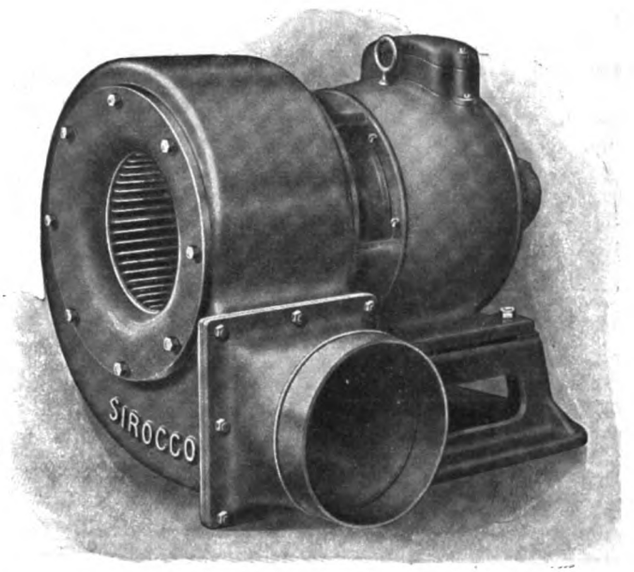


SIROCCO CASED FAN FOR STEAMSHIP PHILADELPHIA.

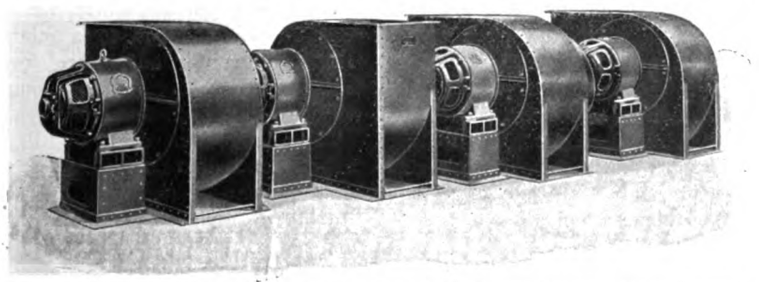
type the blades or vanes are usually of greater length radially than their face measurement parallel with the fan shaft, while the number of blades is generally from six to 12. In the "Sirocco" fan, however, the radial measurement of the blades is much less than their face measurement parallel with the shaft, and 64 blades are ordinarily employed, the tips being curved forward in the direction of rotation. This construction, as a whole, was at the outset considered by scientists as incapable of setting up true centrifugal action, and the fan was described as a squirrel cage of lathes which merely impelled the air by impact; further, it was stated that while this arrangement might do for low pressures, or free discharge, it would be useless against high water gages or inelastic fluids such as water. All these ideas have, however, been contradicted by facts, as it has been proved that the fan acts as efficiently up to 30 in. water pressure as at 1 in., and, further, it has equal ability with a centrifugal pump for water with high or low lifts apart from its efficiency in the propulsion of air.

The blades are curved forward in the direction of rotation, with the result that not only are noise-producing and power-absorbing eddies eliminated, but the velocity of air discharged is so greatly accelerated, that it exceeds the peripheral speed of the blades by more than 70 per cent. In a number of tests the speed of discharge has exceeded the rate of rotation of the tips of the blades by from 70 to 80 per cent. This is an important factor in determining mechanical efficiency. For example, in a 25-in. "Sirocco" fan in actual use at 300 R. P. M., the tips of the blades have a speed of 1,952 ft. per minute. The actual velocity of the air is 1,962 plus 80 per cent, or 3,552 ft. The volume of discharge, 8,000 cu. ft. per minute, figured at a velocity of 3,532 lin. ft. per minute, shows a very high degree of efficiency per unit of power.

These advantages, combined with the fact, already noted, that the turbine type centrifugal fan occupies about only half the space required for paddle wheel blowers, is sufficient explanation of the steadily increasing number of "Sirocco" installations found aboard ship. Until this year "Sirocco" fans were built only at Belfast, Ireland, by Davidson & Co., who have the largest plant in the world devoted exclusively to fan making. The American demand is now supplied by the Sirocco Engineering Co., 138 Cedar street, New York, whose lately completed manufacturing plant is located at Troy, N. Y.



7½-IN. SIROCCO BLOWER DIRECT-CONNECTED TO ELECTRIC MOTOR.



FOUR OF TWENTY SIROCCO FANS FOR VENTILATING STEAMSHIP MAURETANIA.

Improvement of the Chicago river would make the city the greatest marine ship building, manufacturing and commercial center in the world. That was the prediction of Albert H. Scherzer, made before the city harbor commission yesterday. Mr. Scherzer said that he could see no necessity now or in the future for a harbor on the lake front. He suggested that the lake front be reclaimed for a distance of three miles out and developed into sites for parks, public buildings and works of art.

Lieut. Col. Townsend, government engineer, with headquarters at Detroit, is at present making a tour of the various harbors under his jurisdiction upon the government steamer Hancock.

Generated on 2024-08-28 16:14 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Electrical Equipment of the Cunard Express Steamer Mauretania*

BY MR. W. C. MARTIN.

In the equipment of a modern steamship great improvements have been made in recent years for the economical working of the vessel and for the comfort of the passengers. Of all the changes that have been made, none have been more welcome and so thoroughly appreciated as the introduction of electric light.

The first vessel to be fitted was the American steamer Columbia, the lighting of which was carried out under the direction of Mr. Edison in 1880. There were 115 lamps of 10 C. P. and two dynamos driven by belts from a countershaft.

In December, 1881, Professor Andrew Jamieson delivered a lecture to this institution, in which he stated that electric lighting was fast replacing oil lamps on steamships, and gave a description of the installation fitted on the Cunard steamer Servia at a cost of £1,000. When I mention that the total cost of the electrical installations on each of the latest Cunarders has been about £65,000, some idea will be formed of the great progress electrical engineering has made within the last 26 years.

Since the introduction of electricity on board ship, it has proved itself to be the "acme" of perfection for lighting, and has not only added greatly to the comfort of passengers, but has enable ship owners to utilize lower deck spaces to better advantage for passenger accommodation; and not only passenger vessels have benefited by the adaptability, safety, and economy of electricity, but the ordinary cargo steamer of the present day is taking full advantage of it for the safe and rapid handling of cargo. No first class cargo steamer is now complete without electric light, and ship owners are finding a great many charters cannot be secured unless their vessels are lighted electrically.

While it would be interesting to follow the development of the various systems of electrical installations on ship board since the introduction of the first 6-K. W. machines on the little steamer Columbia, to the 1,650 K. W. in four machines on the Mauretania, I can only make a brief reference to some of the more important points.

In the earlier designs of dynamo construction, the generators were run at a very high speed, and in many vessels the power of the engine was transmitted by belts or ropes and countershafts to the dynamos. Belts on board ship are most objectionable, not only on account of the great space required, but because of their unsteadiness. Many attempts were made in the early days to produce some means of connecting the slow-speed engine and high-speed dynamo without belts, but even the most successful arrangement devised, namely, friction wheels, was found unsuitable for all but the smallest powers. Nothing really reliable for ship work was in use, until the advent of the high-speed steam engine made it possible to couple engine and dynamo directly together. In fact, it was this very demand for a suitable engine that led to the development and perfection of the high-speed engine and steam turbine.

The choice of an engine for electric power on board ship is about equally divided between the slow-speed type at from 200 to 300 revolutions, and the high speed of from 500 to 700 R. P. M., while an occasional engineer prefers a turbine. Engineers in charge of these plants claim to have the most satisfactory results regarding efficiency and economy; but, undoubtedly, the steam turbine is the ideal for ship work. It has all the advantages of light weight, less space, steadier driving, higher efficiency under certain conditions, freedom from vibration, and, having no reciprocating parts, there is less wear. It has been proved that, in smaller sizes, the turbines are not so economical in steam consumption, but it is almost certain that this will be overcome, and in the near future the turbo-driven dynamo will become universal.

Since the first installations many new fittings and devices have been invented for safe, reliable working on board ship, and the most important of these is the system of wiring, and the protection of the same. The first insulated wires used for ship lighting were covered with cotton cloth and white lead, and a further protection of rubber tubing when passing through specially damp places.

One of the greatest difficulties in ship lighting has been to find wires and fittings that would not be affected by sea air and water, and it still remains a fact that, no matter how good the quality of the insulating material and armored protection may be, if the wires haave not been well laid by experienced men, deterioration sets in quickly with most disastrous results. Any electric installation fitted today with the best material and workmanship should last as long as the hull of the ship. Ship builders dare not ignore certain standard rules in the building of a ship, but in some instances they are not so particular with regard to the lighting of the same, and it would be to the interest of all concerned if insurance registries and the board of trade took a more intelligent interest in this kind of work.

In preparing an installation to be fitted on board ship, particular attention should be paid to the placing of the wires, so that they might always be accessible and above all things they should be proof against fire and water

In the Cunard steamer Servia there were 117 Swan lamps and two arc lamps equal to about 10 K. W. of 13.4 H. P. In the Mauretania the total output of the four electric generators is about 2,200 E. H. P., while the actual power required for all the lights and motors running at one time is 2,773 H. P. It is found in general practice that, the power being very intermittent, two generators are capable of doing the work, thus leaving a large margin in hand for emergencies.

To find space for such powerful plant and to fit the installation on the safest and most reliable system, presented some interesting problems. The first of these was to determine the most suitable type of steam generator. After due consideration, the Cunard company and the builders of the vessel decided to adopt the steam turbine, by the use of which the space required was reduced to a minimum, with less weight and more freedom from noise or vibration as compared with ordinary high-speed engines.

There are four sets of Parsons' turbo continuous-current generators, each dynamo is shunt wound and is capable of giving an output of 3,750 amperes at 110 volts and 1,200 R. P. M. These generators are placed on an elevated platform abaft the engine

*Paper read before the Institution of Engineers and Ship Builders of Scotland.

Generated on 2024-08-28 16:21 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

room, in two separate compartments divided by a watertight bulkhead and arranged so that, in the event of either dynamo room being flooded with water, the ship could still be lighted from the unflooded side.

A better arrangement for the generators would have been to place them nearer the center of the ship, but being a vulnerable part, the admiralty required them to be placed below the water line, hence the reason for placing them so far aft.

MAIN SWITCHBOARD.

To control this great power with safety and efficiency in a confined space exposed to a high temperature and possible trouble from vibration, required controlling switch gear of a substantial design, yet sensitive in action. The main switchboard is divided into two parts, one section being erected in the port generating room and the other in the starboard generating room.

Each board has two generator panels, 12 feeder panels, and one disconnecting panel. Normally the two switchboards are connected together as one board through the disconnecting switches, but may be separated in a moment from either room, and each side of the ship operated as a separate installation.

The use of fuses for the control of the large currents dealt with, would have been inconvenient and unsafe, and instead automatic circuit breakers (performing the function of both switch and fuse) were fitted.

These circuit breakers are of massive construction, the contact surfaces being pressed firmly together by levers. The make-and-break contacts are massive carbon blocks, at the extremity of the switch arms, and the main circuit breakers are so arranged that the flash at breaking takes place in fireproof compartments well clear of the attendant. To accomplish this object and to make the operation of the switches easy, the handles are placed below and connected to the switches by insulating links behind the board. These switches are held in the closed position by engaging with a trigger which may be released either by hand or by a trip coil.

In order to prevent the opening of the circuit breakers during a momentary overload, a relay is introduced which closes the trip coil circuit when an overload occurs, after a period adjustable up to 15 seconds. Should, however, a reversal of current through the generator take place, the relay promptly closes the trip coil circuit, and thus cuts the machine out of circuit. The opening of the circuit breaker in turn breaks the trip coil circuit, and prevents damage to the coil or waste of energy.

The feeder switches are operated in a similar way, but without the reverse current arrangement. They have, however, in addition, a trip coil in series with the main current, adjusted to open the circuit with a greater current than the relay is set to operate at, but instantaneous in action. Thus, should a short circuit or heavy overload occur and the relay fail to operate, damage to the cables and machinery is effectively prevented.

The relay is simple and reliable in operation. It consists of a small motor, similar to that used in meters, through which part of the current is shunted. This motor tends to wind a strong silk cord onto a drum against the pull of a weight fastened to the other end of the cord. The cord passes round a drum to which the contact arms are fitted. When the current exceeds the overload limit, the torque of the motor is sufficient to wind up the cord, and thus close the trip coil circuits. The adjustments are affected by altering the weights and varying the distance between the contacts.

All the ammeters and voltmeters are of the moving coil type, the former being operated from shunts in the main circuits. By this means it is possible to have the reading instruments in any convenient place, and in the Mauretania two instruments are fitted for each machine, one being in the port and one in the starboard room. On each board, one additional ammeter is fitted, connected to bars behind the feeder panels, and so arranged that it may be connected by a plug to any one circuit at a time. By this means the current in any feeder may be ascertained without the expense of separate instruments for each circuit. Two station voltmeters and two paralleling voltmeters are provided, and the shunt regulators, which are placed behind the boards, are operated by a hand wheel on the front.

MAIN CABLES.

The Cunard company, with their usual precautions for the comfort and safety of their passengers, decided that a high voltage would not be advisable, which accounts for the current being generated at only 110 volts. This necessitated cables of a great carrying capacity, and also very heavy switch gear.

The admiralty further required all main cables to be run under the water line, and to accomplish this it was necessary to utilize the only available spaces in the coal bunkers or through the boiler rooms. Those who have had experience in the lighting of ships will know that these spaces generally are most objectionable for electric wires, especially the coal bunkers. The high temperature of the boiler room, and the very large cables necessitated special precautions being taken to prevent the heat softening the insulation and allowing the cable to sink through the rubber, causing a short circuit. With ordinary armored and lead-sheathed cables, the heat would readily effect the insulating materials. It was, therefore, necessary to adopt fire-resisting covering as well as the usual vulcanized rubber, so that in addition there is a heat-resisting compound and an outer covering of two coats of asbestos braid fitted on the cables.

The double-wire system is used throughout, and there are 48 main cables of about 2 in. external diameter running from the generating station to the various sections of the ship. The power is divided into 24 substations of approximately 100 H. P. each, 12 of these being on the port side of the ship and 12 on the starboard side. Eight of these stations provide power for forced-draft fans, two to supply the engine room machinery, and two for engine room lighting, the remaining 12 being connected to auxiliary switchboards at convenient distributing centers throughout the ship.

AUXILIARY SWITCHBOARDS.

These 12 auxiliary switchboards are placed directly opposite each other, port and starboard, and cross connecting cables are fitted so that, in the event of one section failing, the supply can be maintained from the other side. It should be mentioned here that, as the motors are only used intermittently, there is always sufficient surplus carrying capacity in the cables to provide for emergencies of this nature, thus guarding against any total extinction of the light.

The auxiliary switchboards are fitted in fireproof chambers, principally on the main deck. The switches are single pole, and the fuses double pole —Mr. Lackie's patent zinc fuse—which breaks circuit with a minimum flash. Each board is provided with a spare panel containing spare fuses ready at a moment's notice.

BRANCH CABLES AND WIRES.

From these auxiliary switchboards, vulcanized rubber cables are carried in wood casings to section fuse boxes, which again provide distributing boxes at convenient positions for supplying

Generated on 2024-08-28 16:17 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the lights, the wires being run without joints. These cables running from the main deck to the different sections above are like the trunk of a tree, with branches spreading out to the different decks. Special precautions were taken to keep all positive and negative wires in separate grooves.

In the corridors the casings are arranged so that all wires are accessible at all times. In all the rooms of the ship the frieze forms a covering to the electric casings. A special feature of this is to be seen in the lounge, library, and smoking room, and all over the ship the wires are accessible. No fuse boxes have been fitted, but all fuse panels are built in specially-arranged recesses in the paneling, the panel itself forming the door; a door is also fitted behind for access to the wires. Inside the door, a tablet or card is fitted, giving information of what each branch supplies, with size of fuse.

In the wiring of engine and boiler spaces and other parts of the ship exposed to rough work, the protection of the branch wires calls for special treatment. Some engineers think screwed iron conduit or galvanized iron tubes are most suitable, but experience has proved that tubes sweat and retain condensed moisture which very soon destroys the best insulation. The best results are obtained with parallel twin conductors, each conductor being separately insulated with pure rubber and vulcanized rubber, braided and bound together, then sheathed with an outer armor of galvanized iron wire.

This system of armored twin conductors has special advantages for engine rooms and other exposed parts. It is compact, requires less space, and has as strong a mechanical protection as an iron tube, but does not harbor moisture about the insulation as in the case of tubes. When well coated with paint the armoring is further protected from corrosion. It is watertight and fireproof, has no soldered joints, and is always accessible.

In addition to the lighting and power circuits, there are single-core and multiple-core cables for electric bells, telephones, fire alarms, electric clocks, and the Stone Lloyd system of indicating the position of water-tight doors. These cables are too numerous to give in detail. There are over 200 miles of wire fitted, the copper in which weighs over 100 tons.

ELECTRIC LIGHTING.

There are over 6,300 lamps distributed over the ship, fitted to pendants, electroliers, and brackets of various designs to suit the furnishings of the respective rooms. In the public rooms and state rooms the fittings are of a most handsome design, and the arrangement of concealed lamps for lighting the dining saloon dome gives a beautiful sunlight effect, while other compartments are brilliantly illuminated with beautiful crystal fittings. A special feature throughout has been to design the fittings so as to obtain reflected lighting from the ceilings as well as from the lamp itself.

ELECTRIC POWER.

Electrical transmission of power was evidently not thought of when the Cunard company built the Servia, and it will be interesting to follow the latest development in this branch. In every department of engineering the electrical transmission of power has become almost universal, but on ship board it has made but little progress. In the latest Cunard steamers, however, there has been a decided advancement. In no other steamship, including the most recent German vessels, can be found anything to compare with the electrical installation on the Mauretania.

The Cunard company and their engineers realized that if steam were used for auxiliary work, the loss through condensation in the enormous lengths of steam pipes would be very great, and also that the annoyance to passengers would be unbearable. They, therefore, took full advantage of the simple and more economical method of distributing the power electrically throughout the ship.

In this installation there are:

Sixteen motors aggregating 800 H. P. for forced draught; 28 motors aggregating 276 H. P. for ventilating of machinery space; 18 motors aggregating 400 H. P. for auxiliary machinery in engine room; 16 motors aggregating 52 H. P. for ventilating the ship; 53 motors aggregating 156 H. P. for the thermotanks supplying heated air; four motors aggregating 64 H. P. for refrigerating machinery; two motors aggregating 16 H. P. for two passenger elevators; four motors aggregating 108 H. P. for lifeboat winches; eight motors aggregating 48 H. P. for electric jib cranes, six motors aggregating 78 H. P. for mails and baggage hoists; six motors aggregating 20 H. P. for hoists and stores; two motors aggregating 10 H. P. for printing machinery; one motor aggregating 5 H. P. for wireless telegraphy; 20 H. P. for pantry and kitchen service machinery and hot plates; 80 H. P. for 106 electric radiators for special staterooms, bath rooms, and hospitals, a total of 2,133 H. P. independent of the power for lighting.

The forced draught for the main boilers is supplied by 32 fans arranged in pairs and driven by 16 electric motors of 50 H. P. each; the motors are of the enclosed type, developing the power at 450 R. P. M., with the current at 110 volts. The fan impellers are of the single inlet type, being 66 in. in diameter and each capable of delivering 33,000 cu. ft. of air per minute, against a water pressure of 3¼ inches on the discharge side when running at 450 R. P. M.

Owing to the high temperature in which these motors have to work, a very ingenious arrangement is provided whereby they may be cooled. Situated between the motor at the commutator end and one of the 66-in. fans, is an auxiliary fan with separate casing, the disc being 48 in. in diameter and made of sheet brass. The discharge is connected to the under side of the motor and plate, the air being circulated round the commutator and armature, and leaving at the opposite end. Each fan is provided with a water gage and tachometer. Each motor is also fitted with a controller or switch capable of regulating the speed in equal increments by field variation from 225 to 450 R. P. M. Low voltage and overload automatic releases are fitted to these controllers, giving complete protection to the motors under all conditions.

When running at the lowest speed the approximate output of air from each fan is 17,000 cu. ft. per minute, against a water pressure of 1 in. Each fan room is also ventilated by eight single inlet fans 21 in. in diameter, each being driven by a motor of the totally enclosed type capable of delivering 1,000 cu. ft. of air per minute against a water pressure of 1 in., when running at a speed of 900 R. P. M.

The motors are of the four-pole series wound type, and are each capable of developing normally an output of 5 H. P. when supplied with current at a pressure of 110 volts and running at a speed of 900 R. P. M. Each motor is supplied with a controlling panel consisting of one double-pole quick break switch, tubular fuses, and starting and regulating resistances, the whole being self-contained and mounted upon a panel suitable for erection on the bulkhead.

In the engine room the electric motor performs a most important part in the manipulation of the main turbines and other gear. For dismantling the turbines there are six sets of lifting gear, each consisting of a 30-H. P. motor, driving a horizontal shaft above the turbine, coupled to two 7-in. diameter vertical lifting screws and worm gear, by which means the turbine casing or rotor can be lifted in turn.

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The weight of the L. P. rotor is about 125 tons and the H. P. rotor 72 tons, and these can be lifted in 30 minutes.

One of the best illustrations of the adaptability and usefulness of electric motors on board ship is to be found in the case of the electrically-controlled sluice valves. There are two 75-in. and two 60-in. sluice valves in connection with the high-pressure turbine exhaust steam, and in each of these is fitted a 12-H. P. motor operating a worm gear. Each is controlled from switches on the starting platform, where an index shows the action of the valve. The fact that the valves can be closed in a minute or two by the electric motor, and that it would take four men two and one-half hours to close it by hand, shows a remarkable saving in time and labor in favor of the electric motor. Other useful applications of the electric motor in the engine room is the 30-H. P. motors installed for the turning gear, and 25-H. P. motors which drive centrifugal pumps drawing off surplus water from the condensers.

For ventilating the engine room there are 10 Sirocco fans of 25 in. diameter, each driven by a 5-H. P. motor; six fans of 30 in. diameter, each driven by a 30-H. P. motor; and four fans of 15 in. diameter coupled to 1½-H. P. motors.

The general heating and ventilating of the ship is maintained by 53 thermo-tanks, each fitted with a motor-driven fan, the motors varying from 2½ to 4 H. P., making a total of 156 H. P. Each motor fan supplies a section of the ship with warm or cold air, or by arrangement of valves on the tanks, the fans can be made to extract the air from various compartments.

DECK WINCHES AND OTHER APPLIANCES.

Electric power driving is also extensively used for deck winches, passenger hoists, and other appliances to the extent of 270 H. P.

For the passenger lift, two motors of 8 H. P. supply the power to the winding gear, while other two motors of 15 H. P. supply the power for 40-cwt. baggage hoists, and two 5-H. P. motors operate two 10-cwt. store hoists, while two more of 1½ H. P. control the two 2-cwt. pantry hoists for conveying food from the kitchen. There are also two mail hoists fitted with 12-H. P. motors.

In addition to these there are four electric jib cranes, each made to lift 12 cwt. The lifting motions are operated by a 12-H. P. motor through worm gear, and the slewing motion through worm and spur gearing by a 2½-H. P. motor, the motors being series wound of the enclosed type. These cranes do their work absolutely without noise of any kind and are conveniently placed on the boat deck for lifting stores, or luggage and mails from tenders that come alongside.

Another important part performed by electric power is the hoisting and lowering of the lifeboats. This work is done by four electric winches placed alongside the lifeboats. The motors attached to these winches are each of 27 H. P., connected to worm gear running in an oil bath. The rapidity with which the lifeboats can be manipulated, as compared by hand, must be apparent to all.

An interesting application of electric driving is in connection with the refrigerating machinery.

The two gas compressors are each coupled direct to a 12-pole shunt-wound motor of 35 H. P., giving a constant torque between 40 and 110 R. P. M. The armature is provided with two windings which are in series at starting, and by turning the hand wheel on the switch gear, the starting resistance is cut out and a variable resistance inserted in the shunt circuit to regulate the speed between 35 and 75 R. P. M. By transposing the armature windings from series to parallel connections without resistance, and by inserting the shunt resistance again, the speed can be increased to 110 R. P. M. The two brine pumps are operated by shunt-wound motors of 3½ H. P. each.

In addition to the large number of motors already enumerated, there are still a great number of other applications, but time will only permit me to refer to them briefly.

Among these are the motors for driving the printing machine and the Marconi apparatus of 5 and 3 H. P., respectively, and provision is made by having connections on deck for driving winches of 112 H. P. on the quay or in barges. In the galleys and cooking department an electric motor drives a machine capable of making bread for 3,000 people; and in the cooking ovens there are four vertical spits, driven electrically, capable of dealing with a ½ ton of meat at a time. Other motors are fitted to knife-cleaning machines, dish-washing machines, circular knives for cutting bacon, potato peelers, whisking machine, freezing machines for making ice cream, and numerous electric hot plates for keeping food warm during service.

TELEPHONE AND ELECTRIC BELL SYSTEM.

Telephone instruments are fitted throughout the first class state rooms. Having an exchange on board, passengers can converse with one another without leaving their rooms. On arrival in port the exchange is connected to the Liverpool or New York exchange, so that passengers may be in communication with their homes or offices up till the hour of sailing or immediately on arrival.

Another telephone system connects the captain and officers on watch on the bridge with the engine rooms and crow's nest on the foremast. These consist of Graham's navy-pattern loud-speaking telephones, and are used for docking and steering as well, connections being fitted on the forecastle, in the wheel house aft, and in the steering-gear room at the stern of the ship. For the officers' use there is an intercommunication telephone service fitted, consisting of the Parsons Sloper secret instruments, each officer being able to call up another from his own room.

In addition to the telephone system there is a large installation of electric bells with Gents' patent indicators. In every first class state room there is a combination fitting of electric bell push, electric light switch, connection for portable reading lamp or curling tongs heater, and electric fans, while a number of special rooms are fitted with electric radiators.

A complete installation of electric clocks is fitted on the magnetic system. In the public rooms, and principal entrances, and corridors there are fitted, in all, 48 clocks, controlled from the master clock, situated in the chart room adjoining the bridge.

There is also a complete electric fire alarm system. A brass plate and red lamp indicate the position of the alarm push in the corridors, these being connected to indicators in the engine room and the navigating house on the bridge deck. There is also a subsidiary fire alarm apparatus fitted near the bridge, consisting of a small cabinet into which a number of tubes are led from the various holds, a small electrically-driven fan continually exhausts the air from the tubes, and in the event of a fire it would be easily detected from which hold the smoke issued. A mercury-contact type fire alarm indicator is also fitted in the case, which, with the rising temperature, rings an alarm bell.

In addition to the ordinary life buoys, there are two special buoys fitted on the bridge deck operated by Martin's electric release gear, which can be operated from the bridge and other positions, on the alarm being raised.

Generated on 2024-08-28 16:21 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

In connection with the Stone Lloyd system of water-tight doors, an electric indicator is fitted in the navigating house which shows the position of every water-tight door in the ship. The doors are closed or opened by hydraulic power simultaneously, by the officer in charge moving a handle which operates the control valve. The function of the electric indicator is to show the officer exactly what doors are open or closed. The indicator has a small lamp for each door with wires led to a contact switch at the door which, when the door is closed, completes the lamp circuit and lights the lamp.

Another important fitting on the bridge is Martin's automatic indicator for the navigating lamps, which is shown open and closed. The indicator controls five lights as shown, each light consisting of a duplicate filament lamp, one filament being lighted normally. In the event of this filament failing, the armature of a small electro-magnet which is in circuit is released, and falls against an auxiliary contact, which completes a circuit through the remaining lamp filament and through the indicator lamp corresponding to the light affected. Attention is also drawn to the occurrence by an electric horn attached to the indicator. On the officer in charge pulling a handle the horn ceases to sound, and the electro-magnet is inserted in circuit with the second filament; should this latter fail the horn again sounds, and cannot be stopped until the lamp is replaced or switched off. The several lamp circuits are controlled by the slipper switches seen under the indicator, and the latter—as, indeed, all the important apparatus on the ship—is connected through a change-over switch from either the port or starboard feeder systems, thus guarding against a failure in the navigating lights.

In conclusion, I commend to marine engineers and naval architects a closer study of the advantages of electrical power driving for all auxiliary machinery. The question of propelling the ship by electric motors awaits development, but the electrical equipment of the Mauretania shows many advantages over the present wasteful system of steam engines.

The paper was illustrated by numerous diagrams.

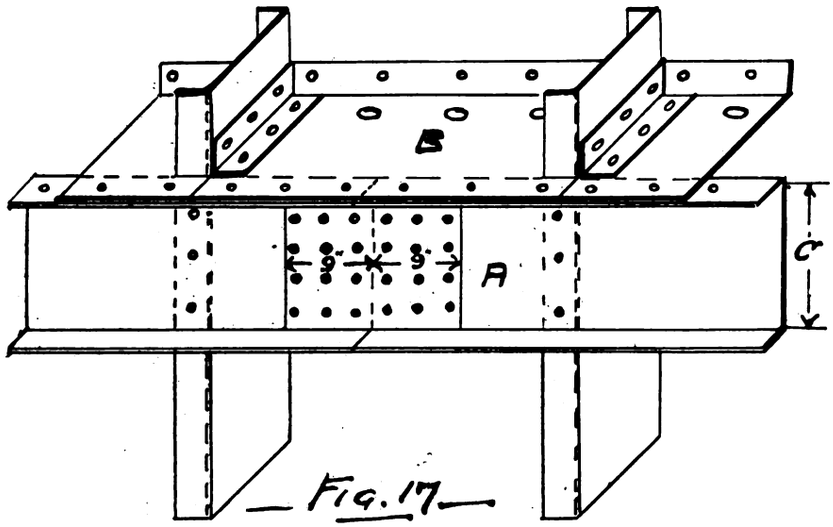
The steamer J. W. Moore, which was wrecked in the Detroit river last season and which was repaired at Ecorse, arrived in Cleveland this week from the ship yard to load coal.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY R. CURR.

An error crept in the article of the issue of March 26 and will be better explained by repeating the article from Fig. 17.

Fig. 17 shows sketch of side stringer arrangement. A is a 12-in. channel fastened to the frame with three ¾-in. diameter rivets.

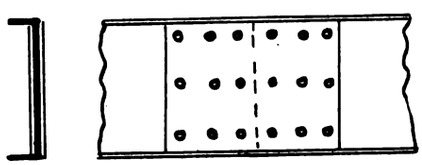


— Fig. 17 —

A single butt strap 12/16 in. thick is fitted in the bosom of the channel for a connection with twelve ¾-in. diameter rivets for fastening same.

This is the same consideration as the connection of two channels back to back, only plate is used instead of overlapping the channels which could not be done in this case.

The butt strap arrangement as this, needs double the number of rivets and practically as much more material.



— Fig. 18 —

Fig. 18 shows a double butt strap arrangement which effects a saving in rivets and makes neater work.

The intercostal B is of more importance here than at the girders connected to the bottom plating.

In this instance double clips are fitted to the intercostal increasing the number of rivets through the frame and adding to the strength of the riveting at the frame channel.

The butt strap A, Fig. 17, is fitted between the flanges of the channel in which case the butt strap must be increased in thickness to make up for the flanges of the channel.

The channel if flattened out would measure 16 inches by 7/16 inches thick and would be equal to 7 sq. in.

The plate for the butt strap must have an area of section of more than 7 sq. in.

The punching of the channel decreases the area of section 3¼ in.

Example. 16″ — 4 × 13/16″ rivet holes equals 13/16 × 4 = 3.25. 16 — 3.25 = 12.75. 12.75 × 7/16 = 5.578 sq. in.

Butt strap equals 11″ — 3.25 for rivet holes equals 7.75 in. 7.75 × 12/16 = 5.81 sq. in. and gives the benefit of the material to the plate for butt strap.

Two pieces half the thickness would be ample in this case for a double strap and there would be a saving of six rivets as shown by Fig. 18.

The double strap gives a double shear to the rivets as explained in previous articles.

This example shows that a considerably greater loss is obtained in punching the heavier material of the same surface measure and care is necessary in comparing the punched and unpunched materials.

A 15-in. strap would be ample for the butt connection A, Fig. 17, which is 18 in. wide but no objections have been raised because of butt straps and butt laps being wider than the rule laid down by the various societies and sometimes circumstances govern the widths of butts and laps.

Sometimes it facilitates the work by making the laps on the plating wide enough to cover the seam lap rivets even when four rows of rivets are needed for laps.

Fig. 22 shows plan of spar deck with one side plated and the plating removed

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

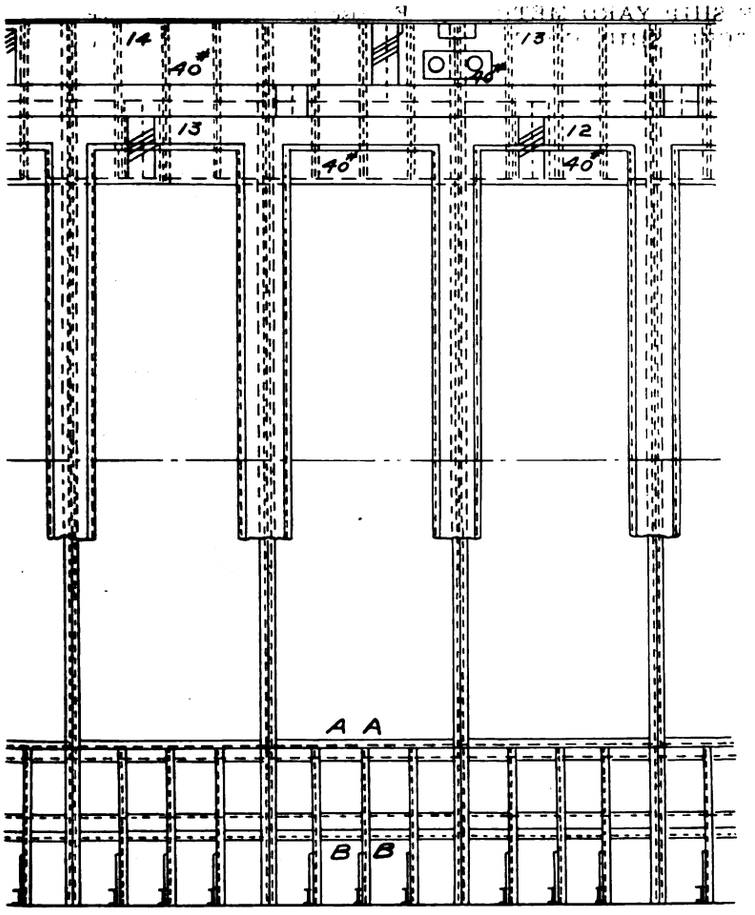


Fig. 22

on the other showing the framing of same.

A and B on this plan show the longitudinals under the spar deck.

more rivets put in increasing the riveted connection but it is not necessary seeing that the web frame comes on the center of the deck plating, giving the aid of a

The lower channel is 15 in. wide, is continuous and treated as a longitudinal. The butt strap arrangement being made as previously explained.

The longitudinal B is made up with a continuous channel running under the

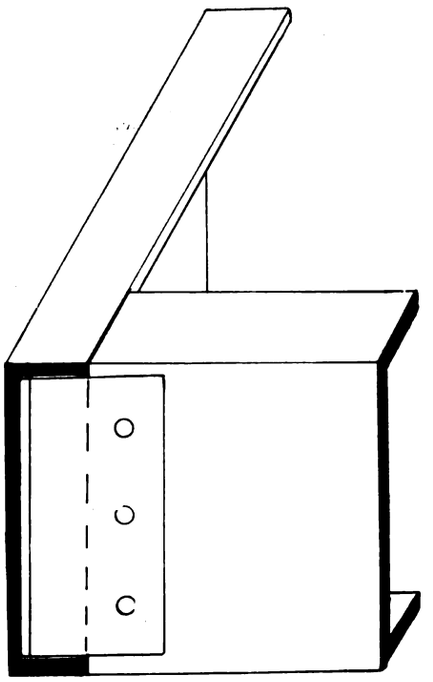


Fig. 25

beams and intercostal plates riveted to the beams and stringer plates as shown by detail, Fig. 24.

The intercostals E, Fig. 24, are made up with flanged plates to deck and fitted snug to the beams as shown by detailed

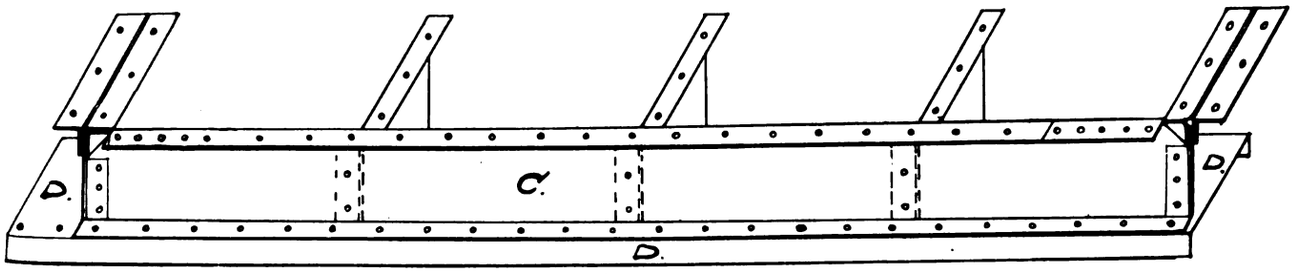


Fig. 23

A is made up with two channels as shown by detailed sketch Fig. 23.

The standing channel C is intercostal between the arch beams and serves the purpose of stiffening the edge of the stringer plate inway of the hatch openings.

The channel, although intercostal, compares favorably with the example of Fig. 17.

The channel C is fitted to the arch beam with double clips and fastened to same with six rivets.

Even larger clips could be fitted and number of rivets in the top flange of the channel and increasing the rivet value so that it comes up to the area of section of a continuous member.

sketch.

Another method of lifting intercostals between the beams is shown by Fig. 25.

The channel is the same section as the

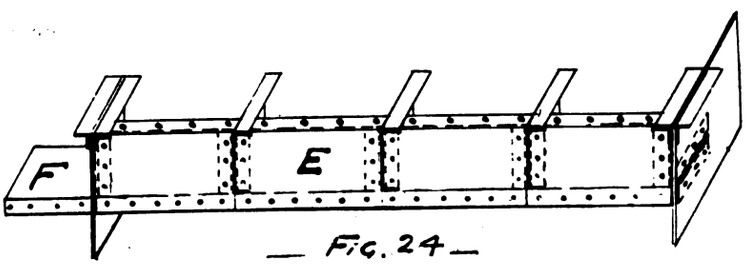


Fig. 24

Generated on 2024-08-28 16:19 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

beam and is cut between the flange of one beam and of other thus saving the cost of cutting out the end to fit snug into the beam on the inside.

The fitting of the intercostals snug in the bosom of the beams adds to the resistance of compressive strains when the vessel is loaded and under sagging strains.

This intercostal also when riveted to the stringer plate prevents buckling which is liable to occur under sagging strains and the deck under compression.

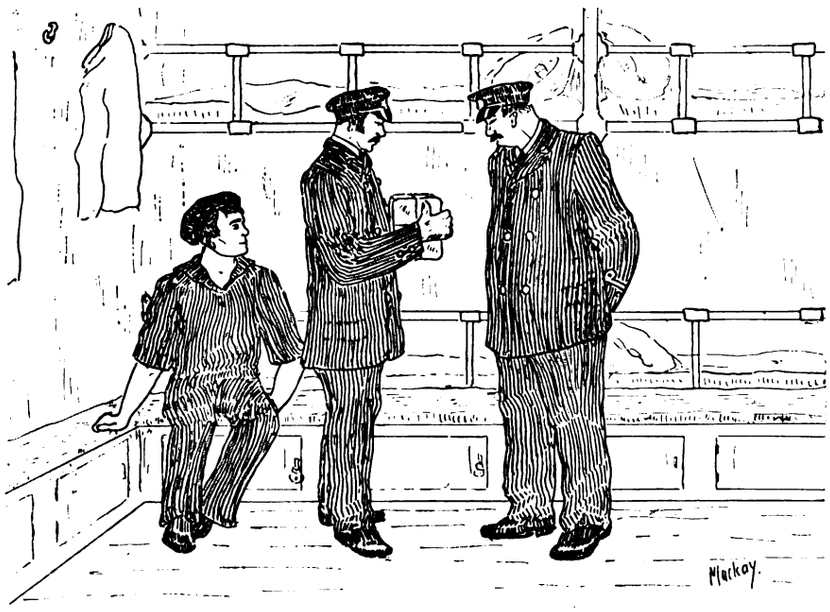
The channel intercostals if fitted so that they are close to the flange of the beam may serve the same purpose in forming a continuous girder under compression, otherwise the only advantage obtained from the channel intercostal would be to prevent the plating from buckling.

In cases where the vessel comes under hogging strains the topsides are under a tensile strain and the three rivets in the intercostals are the only help to the plating.

Under tension the intercostals depend upon the number of rivets while under compression close fitting is of great value and has a tendency to form a girder in the construction.

"IN THE MERCHANT SERVICE"

The British Custom House Officer, as the arriving passenger sees him, is a mild and pleasant-spoken individual who, on receiving your answer to his gentle query "if you have anything dutiable in your luggage?" daintily peeps in the corner or center of your trunk, merely as a matter of form, and, with a polite "Thank you," turns to the next in turn. Nothing could be pleasanter; provided, of course, that the casual search does not bring to light a trifling hundred cigars or quart of cologne. The operation of passing the custom house in England is, on the whole, a pleasure, when compared with what the traveler experiences on the continent, or, worse still, on returning to the United States.



THEY DECIDED TO FIND THE OWNER OF THE BOX.

The British Custom House Officer, as the sailor sees him, however, is an entirely different individual, with an entirely different method of pursuing his calling. He has an exasperating way of doubting the veracity of the crew's statements, a fondness for turning over the entire contents of the lockers and bags, and displays a most diabolical ingenuity in knowing just when an unsuspecting victim is conveying a few plugs of tobacco ashore. This last usually occurs on some dark, moonless night. The tobacco—for no particular reason, of course—is usually being conveyed ashore in the vicinity of the victim's shoulder blades or some other unlikely place, and is always intended as a little gift for the victim's aged grandfather or other relative. In the end it usually winds up with $5 or $15—according to whether the amount of smuggled goods is 1 or 3 pounds—being added to His Majesty's revenue, and the victim departing a sadder and wiser man. Sadder, because he was "pinched," and wiser, because he will adopt another and better method next time.

It will be understood, therefore, that the sailor regards the "searcher" as his natural enemy; especially when it is known that the "searcher" is usually an ex-seafarer, with a dangerous knowledge of the seafarers' habits and wiles. It will be understood, also, this being the case, the seafarer delights in getting the better of the custom's man, which he very often does. And his ways of doing so are many.

And it came to pass that the "Nantucket"—we'll call her—had arrived at an English port and tied fast to the wharf. The custom's men had lost no time in piling aboard, and the search was on. The officers' quarters, fo'c'sle, stores, and other countless nooks and crannies were undergoing a methodical examination, much to the annoyance of the inhabitants thereof.

The "Nantucket," as may have been guessed, flew the American flag aft. She also carried cadets; said cadets being about the average—one-third human and two-thirds imp—but withal a goodly crowd of boys. And in due time a "searcher" appeared in the cadets' quarters, wherein sat a solitary youth surreptiously puffing a cigarette.

"Wot tobacco 'ave you, my lad?" asked Customs, as he turned the shade of his bulls-eye lantern and threw a shaft of light around the semi-darkened room. He was guessing at the number of occupants.

"This is my lot," answered the cadet, producing some cigarette tobacco from a locker. "The other cadets will be here in a minute," he volunteered. With a supercilious air Customs sat down on the cushioned lockers and proceeded to survey the room under the searching light of his lantern. He had been through this room on a previous visit of the ship.

"Wot's in that 'ere package?" he asked, nodding in the direction of a crevice under the deck overhead, in which a box, in the glare of the lamp, could be plainly seen.

"What package?" asked the cadet, adding, "oh—that—I—I don't know anything about it." He was nervous, and Customs noticed it. At this moment another cadet stepped into the room. He showed what tobacco he had and threw open his locker for inspection.

"Maybe that package belongs to you," suggested Customs, transfixing

Generated on 2024-08-28 16:14 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

the cadet with a searching scrutiny.

"*No, sir,*" was the quick answer, "it's none of mine."

The cadets kept dropping in one by one, until the last had arrived. He also showed his locker, but said he didn't use tobacco.

"Don't suppose you ever saw that 'ere package before, neither," said Customs with withering sarcasm, "never 'noo there was such a thing in the plice, did yer?" The cadet said that Customs had guessed aright.

The searcher took the box under his arm and departed in search of his superior. In a few minutes he returned with his chief and the box, and the cadets were given another opportunity to deny the ownership of the box, which they emphatically did. With a triumphant smile the searcher turned to his chief. They decided to find the owner of the box by investigating its contents. The string being cut and the outside wrapper removed showed a wooden box with the lid nailed on. The customs men were so engrossed in their investigations that they failed to notice the cadets sneaking out of the room and lining up outside the door. The lid of the box was removed and a brown paper parcel came to light. Everybody drew a deep breath. Then the paper was torn off, and Customs stood with an old overshoe in his hand.

"Rubber!" yelled the cadets from the door.

"Wot's that?" demanded the angered customs men.

"Rubber!" howled the cadets, as they slammed one another on the back and writhed in exaggerated paroxysms of delight.

The baffled officers threw the wrappings and overshoe into the farthest corner of the room and went aft to report the incident to the officers of the ship. They got little satisfaction from that direction, however, as said officers seemed to think the matter very funny.

"Wot I wants to know," said the searcher, "is, w'y did the young fools 'oller 'Rubber?'"

"Why," said a grinning officer, "don't you see? An overshoe is made of rubber."

"Well," said the still mystified searcher, "did they think we didn't know it?"

And when the cadets were told about it they said, "Aw, what's the use?"

THE "STAND-BY" MAN.

The Heating of Modern Ocean Liners*

BY W. CARLILE WALLACE, ESQ., MEMBER.

The subject of this paper can hardly be said to come under the heading of naval architecture in the strictest sense, and on this account I feel I owe the institution an apology for bringing it before them. On the other hand, when we consider that the modern ocean liner has developed into a vast floating hotel, carrying many thousand souls, the importance, from a sanitary standpoint, of effectually ventilating every part of the vessel, and maintaining the passenger accommodation at an equitable temperature can hardly be overrated.

For vessels of even moderate size, some form of mechanical ventilation has proved to be a necessity, as only by that means is it possible to insure a rapid change of air throughout the passenger and crew accommodation in all kinds of weather. On the modern ocean liner, the higher priced staterooms and suites are occupied much more during the day than was the case when a stateroom was only a 6-ft. x 7-ft. box, with two or four berths in it, as the case might be. Passengers are becoming more difficult to please, and competition is becoming keener, so that a shipping company which wishes to retain its patrons must equip its vessels with all the luxuries of a modern hotel. As maintaining the individual rooms at an equitable temperature is not the least important of these, I propose to restrict the scope of this paper more especially to this problem.

*Read at the spring meeting of the Institution of Naval Architects.

Among the first ocean steamship companies to give the question of ventilating and heating the attention it deserves, the American Line is well to the front, as the St. Louis and St. Paul, built in 1895, were equipped with a very complete system, consisting of a number of pressure fans, placed on the boat deck, forcing air by means of suitable ducts into the principal staterooms, public rooms, and alleyways, the air being warmed by passing over steam-heated coils, suitably arranged close to the fan discharge. Suction fans are also provided and connected to another set of ducts, for drawing away the vitiated air from the different rooms. This system has worked fairly satisfactorily as far as the ventilation is concerned, but it has been found impossible to regulate the heat in the staterooms with any degree of certainty.

Leading a double set of ducts throughout the vessel is expensive in first cost, and, as space is naturally restricted, the ducts require to be kept small; this necessitates an increased velocity of air in the ducts so as to get sufficiently rapid change of air in the rooms, as the power to drive the fans increases as the square of the velocity, and it becomes apparent that this, together with the increased skin friction consequent on the higher speed of the air, very greatly increases the cost of the operation.

A very similar system of ventilation is fitted in the newer vessels of the Red Star Line, the warm air being discharged, in these vessels, into the public rooms and alleyways on the different decks, exhaust fans for the removal of the vitiated air being fitted, having ducts leading from the staterooms, these latter being dependent for heat on the warm air from the alleyways being drawn in through Venetian panels in the doors to supply the place of the vitiated air drawn out by the exhaust fans. In cold weather, it is found that this system is inadequate to warm the outside rooms, even when the temperature in the alleyways and other parts of the ship is high and the inside rooms much too warm. In summer, with the outside temperature uncomfortably high, this system is worse than useless as a means of cooling the vessel, as observation has shown that the air discharged into the alleyways, etc., by the pressure fans is, for several easily explained reasons, from 5 to 10 degrees Fahr. above the temperature of the outside air, and, as the exhaust fans alone are not of sufficient capacity to ventilate the vessel, there is no alternative in warm but stormy weather between having the vessel uncomfortably hot through forcing in fresh heated air, or stuffy and ill ventilated, through depending entirely on the exhaust system.

To get over these difficulties numbers of other schemes have been tried, as, for instance, making the ventilation and heating systems more or less independent of each other, the heat in these cases being supplied by individual steam or electric heaters placed in each stateroom and more or less under the control of the passengers

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

themselves, the ventilation being effected by exhausting the vitiated air from the rooms and alleyways, the fans and ducts being of sufficient capacity for this purpose, the fresh air entering by storm-proof ventilators, doors or other openings in the passenger accommodation. This system has the advantage of enabling the heat to be regulated without affecting the ventilation in the staterooms, the temperature there being adjusted to suit the varied ideas of the occupants. That this adjustment is a matter of no small importance will be vouched for by any chief engineer in the Atlantic service; for, should he be so unfortunate as to have Americans and Englishmen in staterooms supplied from the same warm air ducts, he will have a condition of things which will give him considerably more worry during the voyage than will the main engines.

There are so many manifest objections to placing steam heaters in all the rooms, that it is hardly necessary to enumerate them. They are apt to cause an unpleasant smell when first turned on, the multiplication of valves and pipes is a very serious evil, to say nothing of the risk of some of the heaters freezing and bursting while the vessel is lying in port in winter on the American side.

On the other hand, electricity lends itself admirably to individual heating at very small initial expense, as every stateroom is wired for lighting, and it only becomes necessary to increase the size of the wires to provide for the extra current. The only objection to its extended use hitherto has been the cost of operation.

With the idea of meeting the difficulties already enumerated, and dispensing, if possible, with individual heating, there has been installed on board the Lusitania and the Mauretania an elaborate system of heating and ventilation which is fully described and illustrated in the Lusitania number of *Engineering* (Aug. 2, 1907), and the Mauretania number (Nov. 8, 1907). All this work was carried out by the Thermotank Ventilating Co., Glasgow, and is, I think, without doubt the best and most thorough scheme so far supplied to any vessel. One special feature which, in the opinion of the writer, will be found of great advantage in warm weather, is the possibility of being able to reverse the direction of the air currents in the ducts, the fans under these conditions exhausting the foul air from the rooms in large quantities, thus causing fresh air to be drawn in through open side lights, doors, windows, ventilators, and other available openings.

With regard to the practical working of the system, I believe it has given excellent results as far as the heating and ventilation of the third-class accommodation is concerned, also in the large public rooms and open spaces in the passenger accommodation. Unfortunately, from structural and other reasons, it has been found impossible to avoid supplying inside and outside staterooms with warm air from the same thermotanks; on that account, I fail to see how it is possible to supply a sufficient quantity of fresh air at the same temperature to ensure proper ventilation to both these classes of rooms, at the same time keeping them at the same temperature.

It is only necessary to glance at the plan of the engine and boiler space of these vessels to appreciate the enormous amount of heat which must be radiated from surfaces inside the hull. The major portion of this heat, no doubt, escapes by means of the funnel-hatches, and engine room and stokehold upcast ventilators, but still a large amount must be conducted through the decks, bulkheads, casings, etc., tending to warm up the interior of the vessel.

For this reason there must be many inside rooms, even as high up as the promenade deck, which will require but a very small amount of additional heat to make them comfortable, even in the coldest weather, whereas, for the outside rooms on the same deck, with one side, and in some cases two sides, exposed to the weather, a large amount of heat will be required. That this internal heat, so to speak, exists in a vessel, is borne out by observation under all conditions of weather conducted on the steamship St. Paul, which show that unoccupied staterooms, depending on their position on the vessel, maintained a certain definite temperature above the outside air throughout the voyage.

From a careful analysis of the different systems of heating, I am led to the conclusion that the one best adapted to large passenger steamers is a combination of a system similar to that fitted on board the Lusitania and Mauretania, supplemented by a system of individual electrical heating, the whole combination being under automatic control.

Until very recently there has been no reliable automatic device for regulating the temperature of a room warmed by an electric heater. Numbers of electrical thermostats have been patented, but they have all failed under the test of practical application, and, whatever possible success they may have attained on land, they were absolutely useless on board a steamship owing to their extreme sensitiveness to vibration.

Some years ago the attention of Dr. Geissenger, surgeon of the steamship St. Paul, was drawn to the necessity of some means of regulating the temperature in his stateroom, which was supplied with an electric heater, as he found that if he left the heater on while absent, the room became much too hot in moderate weather, whereas, if turned off, the room became too cold. Any attempt to use existing thermostats was an utter failure, as he at once found that, owing to vibration, the switch controlling the heater would be destroyed in a few hours, and the contact points of the thermostat itself ruined through oxidization. As a final result of his investigations, he has succeeded in constructing an electrical thermostat which is positive in its action, controls the temperature within one degree Fahr., is absolutely unaffected by vibration, and requires only 2.75 watts for the controlling current.

For use in staterooms, the instrument is a combination of two thermostats in one case, the one set for a day temperature of, say, 68 degrees Fahr., the other for a night temperature of, say, 64 degrees Fahr., both these temperatures being easily adjustable to suit the requirements of the occupant of the room.

The use of a lower night temperature is very desirable from a health point of view, but it has also an important bearing on the quantity of current necessary to maintain this lower temperature as will be seen later. To change from the one temperature to the other, it is only necessary to throw over an electric switch, when the thermostat takes care of the rest. This thermostat has now been in use in Dr. Geissenger's stateroom for two years with perfect success.

That there is a very important saving in the amount of heating current when properly regulated, and that in such case the cost of electrical heating is moderate, is clearly demonstrated by the following report of and deductions from a series of observations taken during several voyages of the St. Paul and Oceanic between Nov. 23, 1907, and Jan. 25, 1908.

The surgeon's cabin is an outside room situated on the first covered deck, and is 7 ft. 6 in. x 8 ft. and 7 ft. 6 in. high. The ceiling of the room is composed of the bare plating and beams of an exposed deck. The outside paneling is entirely uncovered between two frames, and, therefore,

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

this area is practically exposed to radiation through the steel hull to the external air.

The cabin is provided with a liberal supply of fresh air through a duct and 4 in. x 4 in. uptake, and the door is arranged with the customary Venetian panel. The ventilation, therefore, is quite up to the standard, and for certain reasons the incoming air is rarely or but slightly heated. For this particular room the demand on the heat supply is therefore certainly as heavy as that of the ordinary promenade deck stateroom. The room is warmed by one of the regular electric heaters manufactured by the Consolidated Car Heating Co., of New York City, which consumes eight amperes at a pressure of 110 volts.

For the purpose of observation the days were divided into two periods, viz., 8 a. m. to 11 p. m,. and 11 p. m. to 8 a. m., which in the following data are referred to respectively as "Day" and "Night." (See chart, Fig. 1, Plate I.)

During the day the temperature was kept at 69 degrees Fahr., and at night at 64 degrees Fahr., by means of the Geissenger electro thermostat. The thermostat was arranged to operate on a switch which controlled the amount of current supplied to the electric heater aforementioned. In the circuit between the said switch and the heater was placed a wattmeter, which recorded accurately the amount of current consumed by the heater in keeping the room at the desired temperature.

Careful records were taken of the wattmeter readings, as well as the external temperature, and that of the incoming air for both day and night periods.

All these data are plotted in the charts herewith, Fig. 1 being the graphical record of the east-bound trip, and Fig. 2 that of the west-bound trip. Summing up the observations taken the following results were obtained:

With reference to the remarkable difference in power used in the day and night periods, it should be stated that the consumption for the night is so much smaller than that for the day, because the actual time of observation is much shorter and, also, because the amount of heat required to raise the warmth of the room from the night temperature to the day temperature is comparatively large, and, naturally, it appears in the total reading for the day.

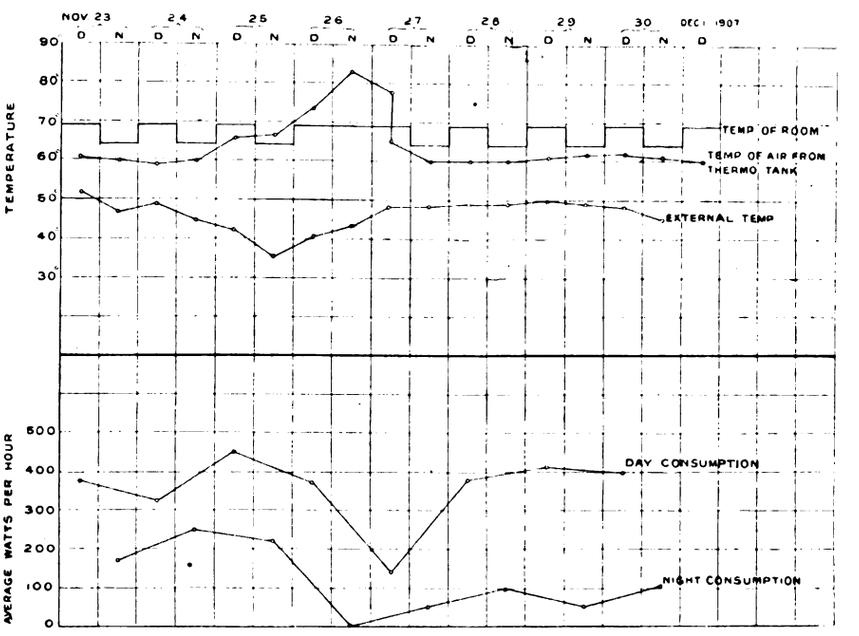
The following observations conducted recently on board the steamship Oceanic should be of interest to naval architects, showing, as they do, the average expenditure of electric energy of a typical and purely electrical system of heating, where the passenger has complete control of the heaters.

The halls and public rooms of the vessel are heated by means of steam coils, whereas the staterooms on the two upper decks are heated by electric heaters, consuming on an average 1,200 watts per hour each. These rooms being on the promenade decks are ventilated by means of ducts, one to each room, having an intake close under the deck in the center of the outside alleyway or promenade, leading from thence into the side of the deck-house, down the side of stateroom behind the casing, and opening to the room through a ported slide, just behind the electric heater, which is placed under the sofa. The doors have solid panels, movable louvres being fitted at the top of the room between the beams and leading into the hallways.

Through the courtesy of Mr. Blake, superintendent engineer of the White Star Line in Southampton, an accurate record was kept of the consumption of current used in heating the staterooms of this vessel during one round voyage, Figs. 3 and 4 (Plate II.) being the graphic record of the west and east bound trips respectively.

It is worthy of note here that, though this ship was originally fitted with multiple circuit heaters and switches, giving medium, low and maximum heat, it was found advisable to substitute simple heaters of maximum capacity, as the finer sized wires of a divided circuit heater frequently burnt out and gave trouble. It was also found that the average passenger did not possess sufficient mechanical knowledge to master the graduation of the switch, and was disposed to

Fig. 1.


VOYAGE Nº 151 EAST S S "ST. PAUL"
NOV 23 24 25 26 27 28 29 30 DEC 1907
TEMPERATURE
TEMP OF ROOM
TEMP OF AIR FROM THERMO TANK
EXTERNAL TEMP
AVERAGE WATTS PER HOUR
DAY CONSUMPTION
NIGHT CONSUMPTION

SUMMARY OF OBSERVATIONS.

VOYAGE NO. 151, EAST, S. S. ST. PAUL.

	Day.	Night.	Day.	Night.
Average external temperature	47.1 deg.	44.8 deg.		
Average temperature of incoming air ventilation	64.3 deg.	64.4 deg.		
Actual consumption by Wattmeter			31.9 K. W.	4.8 K. W.
Extra electrical energy consumed by lamps and resistance			9.0 K. W.	3.4 K. W.
Net consumption			40.9 K. W.	8.2 K. W.
Total for trip			49.1 K. W.	

VOYAGE NO. 152, WEST, S. S. ST. PAUL.

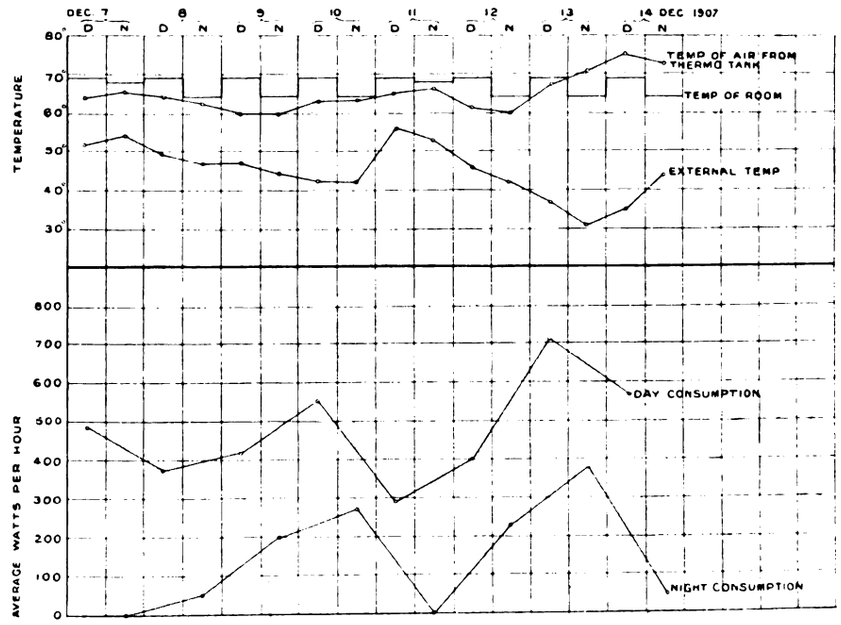
	Day.	Night.	Day.	Night.
Average external temperature	45.5 deg.	44.7 deg.		
Average temperature of incoming air ventilation	64.6 deg.	64.8 deg.		
Average temperature of room	69.0 deg.	64.9 deg.		
Actual consumption by Wattmeter			50.6 K. W.	7.1 K. W.
Extra electrical energy in room consumed by lamps and resistance			9.5 K. W.	2.5 K. W.
Net consumption			60.1 K. W.	9.6 K. W.
Total for trip			69.7 K. W.	

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

throw the blame for any extremes of temperature on to this mechanism.

Any one who has had sea experience will appreciate the foregoing observation of the mental apathy of passengers of all classes; for, if a passenger is to be made comfortable, it must be accomplished without effort on his part, and I believe that by far the greater number of complaints regarding heating and ventilation are really due to the passenger's neglect or inability to help himself by the means of regulation provided, in any properly installed system.

Fig. 2.



As a means of determining the actual amount of current necessary to maintain a given temperature in the rooms of the Oceanic, a test was made on Jan. 28, 1908, while the vessel was lying in dock in Southampton, upon a representative room on the shelter deck. This room is 9 ft. x 9 ft. x 8 ft. 3 in., with two square ports and one exposed side; the ventilator and heater being as already described. The heater was tested and found to consume 1,045 watts. The external temperatures were 44½ degrees at the beginning and 42 degrees at the end of the test. The room, which had been closed for three days, was found to be at a temperature of 57½ degrees, and, by deduction, the effect of the internal heat (I) was estimated to be 10 degrees (that is, the room would have been at the standard temperature of 70 degrees if the external temperature had been 60 degrees). The heater was run full power till the temperature reached 69½ degrees, when, after several tests, it was found that, if the heater were on for a period of two minutes and off three minutes, the temperature remained constant at 69½ degrees, the radiation expressed in terms of electrical energy was therefore determined to be 418 watts per hour, when the external temperature was 42 degrees, and the internal heat, as already stated, 10 degrees, and for this special room may be expressed by the equation W = 24 (R—E—I), where W equals watts per hour, R equals temperature at which the room is to be maintained, E is the external temperature, and I the internal heat.

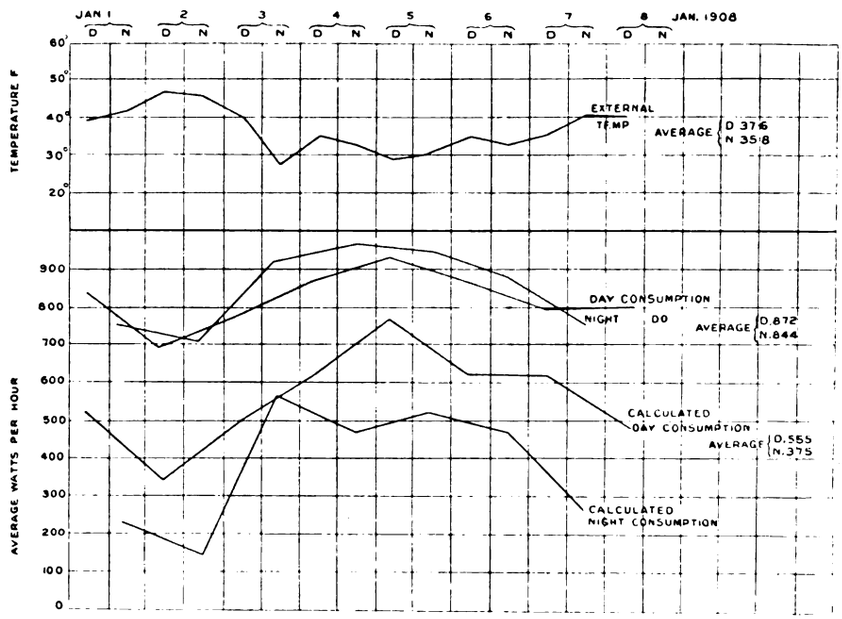
It was also found that 520 watt hours were required to raise the temperature of the room from 64 degrees, the night temperature, to 69 degrees, the day temperature, in addition to the amount radiated.

It will be noted that I have plotted on the chart of the Oceanic a curve of theoretical consumption of energy based on the foregoing formula, with an assumed temperature for room of 69 degrees during the day, and 64 degrees at night; and, in view of the large difference between the theoretical and observed consumption of energy, it may be well to consider in what way the conditions at sea may modify the observations of heat dissipation taken in port.

The ventilation of the room, depending as it does on the force and direction of the wind, is, no doubt, greater at sea than in port; but, assuming that the extra amount of air entering the room was 10 cu. ft. per minute, the consumption factor would be increased by 4 (R—E), or, approximately, from 24 to 28, or about 16 per cent.

On the other hand, the internal heat (I) would be naturally larger with the boilers in full operation. On the steamship St. Paul I has the values of 8 and 12 in port and at sea respectively. This correction, if applied to the Oceanic, would increase I from 10 to 15, and decrease W by 120, or about 28 per cent. The adjoining rooms and hallways would also be at a higher

Fig. 3.



Generated on 2024-08-28 16:21 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

temperature; therefore, it seems safe to assume that the estimation of electric energy in port is in excess of the sea requirements.

The records of actual consumption were obtained by running the heaters of the staterooms from one machine during the entire voyage, and reading the ammeter every two hours. The external temperatures were also taken every two hours.

The steamship St. Paul, sailing from both ports three days later than the Oceanic, encountered different temperatures, and the consumption, as recorded for comparison, is corrected for these differences, the equation for this vessel being W 20 (R—E—I) for radiation, + W20 (R—A) for ventilation, where I = 12 and A = the temperature of the incoming air.

In presenting these records to the institution, I have divided the consumption by the number of rooms occupied on the trip by passengers. It is obvious that at no time were all the heaters in use, owing to the wish of some of the occupants for cold air, and that the reduction to an average of one room is rather unfair to a comparison of a definitely heated room, however valuable to the engineer, as an average daily record of power used.

The records of the Oceanic are especially interesting, in that they show the consumption of energy in two extreme conditions. On the west-bound voyage this ship passed through exceptionally cold weather, as evidenced by the average temperature, 37.6 and 35.8 day and night, whereas, on the east-bound passage, the average temperatures were 53 and 52.4, temperatures more in keeping with the month of May.

In this connection it is surprising to find such a small difference in the consumption of power between the two voyages, thus proving the statement already made, that the average passenger does not use his heater with reason, or even cater for his own comfort in the smallest degree.

It will be noted that the corrected consumption of the steamship St. Paul comes into very close agreement with that calculated for the Oceanic, and verifies most strongly the basis on which the latter calculations were made.

On the charts of the steamship St. Paul (Plate I.) the top lines show the temperatures of the room, ventilating air, and external air. The room temperatures are shown for convenience as sharply broken lines, though the change from high to low, and the reverse, necessarily takes some time. The other temperatures are recorded in curves joining the average for the period, and do not show the hourly variations that are actually found in the ventilating air, when steam is turned on.

Combining the known data as to engines, dynamos, and cost of coal with the results of the observations above referred to, we obtain the following results:

Source of Power—Compound direct-connected dynamos of about 90 H. P.

	Per cent.		Lbs.
Engine efficiency	85	Coal per I. H. P.	3.5
Dynamo efficiency	90	Coal per Electr. H. P.	4.4
Electrical net efficiency	76½	Coal per K. W.	5.9

Cost of coal in bunkers, $4.00 (16/5) per ton, 2 c. (1d.) per lb.
Cost of coal per K. W.-hour, say 1.2 c. (2.4 farthings).

Taking the cost for coal at 1.2c per K. W., which is certainly a low estimate, and applying it to the estimated waste of electrical energy, in the case of the Oceanic, we get for the west-bound voyage a loss of $33.92, and east-bound, $52, or on the round voyage, say, $86, or £17 13s in heating 49 staterooms. For seven round voyages per year, during which heat is certainly advisable, we get a total of £123 11s per annum, which might be saved by placing the heaters under automatic control, so that, regardless altogether of the luxury of definite temperatures, the subject becomes a matter of some financial importance.

To apply this system of thermostat control as an adjunct to the thermotank system, it only becomes necessary to fit a specially designed electrical arrangement for operating the steam supply to the thermotanks supplying air to the staterooms, this arrangement being under the control of a Geissenger electro-thermostat adjusted to regulate the temperature in the air ducts so as to maintain a comfortable temperature in the inside rooms. To attain this object the temperature of the air leaving the thermotank can be kept constant, or the thermostat so arranged as to maintain a constant difference of temperature between the said air and that outside as may be found most effective. The additional heat for the outside rooms is supplied by individual electrical heaters under the control of thermostats placed in each stateroom.

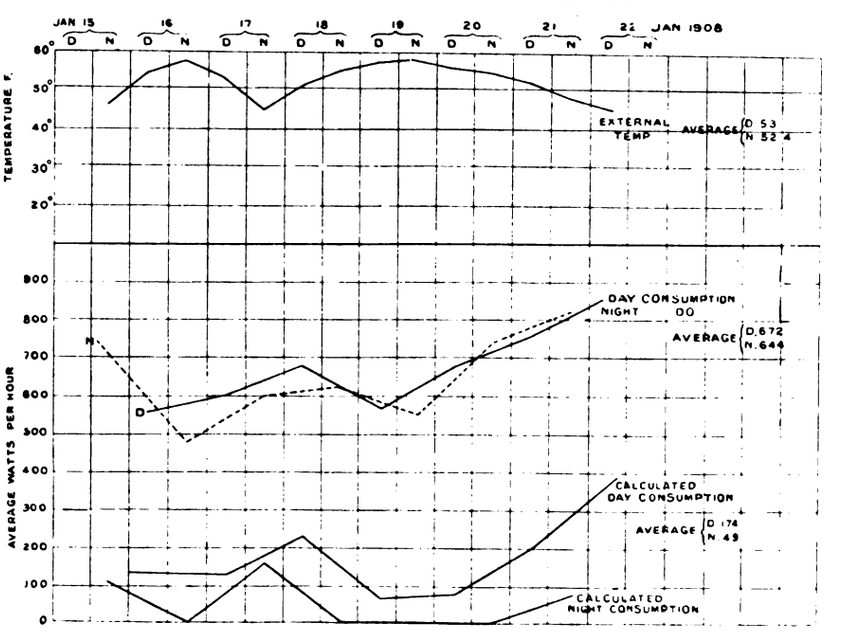
A glance at the graphic record of temperatures on the two trips of the steamship St. Paul at once shows the inability of the engineering staff to properly regulate the temperature of the air as supplied to the vessel, so as

SUMMARY OF OBSERVATIONS ON S. S. OCEANIC.

	Voyage West. Day.	Night.	Voyage East. Day.	Night.
Observed consumption of electrical energy in watts	872	844	672	644
Calculated consumption	555	375	174	49
Observed consumption on S. S. St. Paul, automatic control corrected for difference in temperature	536	296	191	0
Apparent waste on each room, S. S. Oceanic	257	467	498	597
Waste on voyage of seven days each room in K. W.	27.0	31.9	52.2	34.5
Total waste night and day in K. W.	58.9		86.7	
Number of rooms occupied	48		50	
Total waste on rooms occupied in K. W.	2,827		4,340	

Fig. 4.

VOYAGE EAST S S "OCEANIC"



Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

to compensate for the changes of temperatures outside. In vessels of larger size, where the number of thermotanks is very considerable, the necessity for automatic control becomes apparent.

EXAMINATION FOR REVENUE CUTTER SERVICE.

An exceptional opportunity is now offered bright young engineers to enter the government service as commissioned officers and secure a life position, with all the advantages of longevity pay, retirement for age or physical disability incurred in the line of duty, etc., as now obtain in the United States army and navy.

The United States revenue cutter service will hold an examination for the selection of candidates for appointment as cadet engineer, to fill existing vacancies in that service, beginning Aug. 24, and covering a period of five days. This examination is open to all young men between the ages of 20½ and 25½ years who have had the necessary engineering training, either at some technical school or in actual work, and who produce satisfactory testimonials of experience and good character.

The successful candidates will be appointed cadet engineers, and then probably will be assigned to the United States revenue cutter Itasca, which vessel is the practice ship for cadets. During the term of service on the practice ship the cadet engineer is paid at the rate of $75 per month and an allowance of 30 cents per diem for commuted rations.

After serving not less than six months on this vessel, if he is found to be proficient in his duties, with the proper conduct and bearing of an officer, the cadet engineer is commissioned a third lieutenant of engineers in the regular line of promotion; his salary is increased to $1,700 per annum, and he is assigned to duty on some one of the large cruising cutters stationed at the various ports of the United States.

Any person desiring full information relative to this examination should address the secretary of the treasury, Washington, D. C., stating his full name, age and experience, upon receipt of which request a pamphlet will be forwarded setting forth the proper manner of making application for examination and other regulations governing the admission of candidates.

A UNIQUE TIMBER TESTING MACHINE.

Washington, June 30.—Bridge builders and contractors for buildings which are intended to carry variable loads will find much of interest in a unique machine designed by the government to help them to answer the question which comes up very often: How is the strength of wood affected by repeated shocks? At the present time no satisfactory answer can be given. To fill the need for information on this important subject a special form of impact machine has been designed by the United States forest service to investigate the behavior of wood under repetitive loading, and it is to be built by the University of Washington, at Seattle, Wash., and is to form a part of the forest service timber testing station operated in cooperation with the university.

This machine will be provided with a 1,500-lb. hammer which can be dropped upon the wood specimens under test from any height up to 3 ft. It is so constructed as to be both automatic and autographic. The record showing the behavior of the specimen under test is drawn on a long sheet of paper which constantly unwinds from one cylinder and rolls upon another. This record is drawn by means of a pencil attached to the hammer of the machine. When the machine is started the hammer is automatically raised to a height previously determined, when it falls on the specimen and continues to be automatically raised and dropped until the machine is stopped.

From the results to be obtained from the tests made with this machine the forest service hopes to be able to devise more accurate and reliable methods for calculating the stresses which timbers used in bridges and other structures subject to repetitive loading have to stand.

ANNUAL REPORT OF CRAMPS.

The annual report of the William Cramp & Sons' Ship & Engine Building Co. for the year ended April 30 last was issued last week, showing net profits of $555,000, and net surplus over charges of $242,000, both well above last year, the gain in both cases exceeding $200,000. The report shows a reduction in the profit and loss surplus owing to the paying off of $185,000 of the company's debt; the purchase of $78,000 worth of new tools, and the purchase of $48,000 of mortgages.

President Henry S. Grove, in the report, states that, although the unsettlement of business following the panic still continues, and as a consequence the volume of curent business is less than in previous years, and that the uncertainty of commercial conditions makes it difficult to form any judgment as to how long this condition of affairs will continue, nevertheless much has been accomplished since the last annual report to strengthen the company's effectiveness and resources.

SCOUT CRUISER SALEM'S RECORD.

The scout cruiser Salem, built by the Fore River Ship Building Co., Quincy, Mass., and equipped with Curtis turbines, made 26.885 knots over the measured mile. The scout cruiser Chester,' built by the Bath Iron Works, Bath, Me., and equipped with Parsons turbines, made 26.07 knots. The Salem, therefore, appears to have an advantage. It is understood that an efficiency test now will be held in the near future in which the Salem, Chester and Birmingham will take part, the Birmingham having reciprocating engines. Such a test will be of unusual interest.

AN INTERESTING EXPERIENCE WITH ALBANY GREASE.

Messrs. Adam Cook's Sons, 313 West street, New York City, N. Y., makers of Albany Grease, recently received a letter from H. N. Saxton Jr., president of the Knoxville Saw Mill Co., Ltd., Knoxville, Tenn., which tells of an interesting experience with Albany Grease, and points a remedy to lubrication troubles generally. We quote:

"Friends of ours some time ago had trouble with the bearings on the bottom shaft of a band resaw. They said they had tried everything that had been suggested, but still the bearing continued to heat. An expert was called in and said the shaft must have sprung. They took out their shaft and had it trued up, but the bearing still got hot until they asked our advice and we recommended Albany Grease, which they tried and have had no further trouble. We had the same experience some time ago with the bearings on our band mill on account of the strain. The box kept burning out and we decided to try Albany Grease on this bearing and have had no further trouble. You cannot recommend it too strongly for the use on bearings in a band saw mill."

John F. Craig, president of the Craig Ship Building Co., Long Beach, Cal., has received a contract to build a steel dredge for the Western Marine Dredging Co. to be 110 ft. long, 35 ft. wide and 7½ ft. deep.

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Electric Propulsion of Ships, With Note on Screw Propellers*

BY HENRY A. MAVOR.

The electrical engineer is on the outlook for new worlds to conquer. He has placed his mark on all other branches of engineering, and it does not seem too much to expect that he may also have a share in the further development of marine engineering.

No great advance takes place without a preparation for change.

The applications of electricity have been conspicuous examples of this rule. The end of the first 30 years of the history of the practical use of electricity for the transmission of motive power is approaching. Two generations of steam engineering preceded its advent, and prepared the way for rapid development. On land steam engineering and electric engineering have exercised a powerful mutual influence, and the development of the steam turbine has been a direct outcome of this interaction.

The use of the steam turbine for propelling ships is already strongly influencing marine engineering, and this would in itself justify a re-examination of the problem from a new standpoint.

The use of steam in a turbine involves essentially a speed of rotation far above what is customary in reciprocating engines. Formerly existing methods have involved direct application of the energy of the prime mover to the propulsion of the ship, and these methods are closely related to the comparatively slow speed of rotation of the reciprocating steam engine. It is not surprising, therefore, that the steam turbine, when applied to marine propulsion, should be materially modified, and that the marine steam turbine is a compromise in which some sacrifice of economy has been made for the sake of avoiding a greater loss due to the characteristics of the propelling apparatus.

Within the limits of practice, the efficiency of the steam turbine is increased by increased speed of revolution; while the efficiency of the propeller is decreased by a corresponding change.

Fast running turbines and slow running propellers are respectively highly efficient instruments, but hitherto there has been no proper method of coupling them together. The underlying principle of the proposals here made is the use of a high-speed turbine running at a uniform velocity for all speeds of the ship, and driving a dynamo from which electric power is taken to a variable speed motor or motors coupled direct to the shafts of propellers of maximum efficiency.

The dynamo and motor here occupy an intermediate position, as indeed they do in all cases, between the power and the work, and in effect constitute a gearing which can submit to modifications of its own characteristics, to meet the characteristics on the one hand of the prime mover and on the other hand of the machinery to be operated.

It is precisely in this region that electricity has found a place in engineering on land, and it is now proposed to examine the possibility of its use at sea.

If such a possibility can be established, and practical applications made, no doubt the methods of applying the power will be subjected to modification; but this reaction has been on land of very slow growth, and little has yet been done in the way of making special machinery to take full advantage of the properties of electric transmission.

For this reason it is not necessary to enter into any questions involving material modification of the ship or the methods of operating it.

For present purposes, in considering electric motors, attention may be confined to two types which have proved themselves capable of the most extended adaptation.

The use of alternating currents for electric distribution is developing very slowly in Great Britain. The reasons for this are various, the most important being that continuous current had established itself as a commercial success before the advent of the multiphase systems. But even in new countries where development the most convenient lines is free, the continuous current still holds the field for direct application of power, and in the application of electricity to transit, continuous current methods are still in the first position, notwithstanding the fact that the power stations are equipped with alternating current plant, the supply to the street cars is by continuous current, the conversion being accomplished in sub-stations.

A very important fraction of the total electric power generated in this country is used in this way, and this has tended to perpetuate the idea that alternating currents are not suitable for direct applications of power.

The superiority of the multiphase alternating induction motor in respect of compactness, endurance, and simplicity, together with the fact that nearly all large electric generators over about 1,000 horsepower are made for alternating current, is gradually leading to a more general adoption of this class of machine, and attempts have for some years been in progress to overcome its difficulties in practical application.

The chief of these difficulties is the low torque at start, that is to say, when the motor is at rest it requires artificial means to enable it to develop its full turning moment. These means are more complicated and costly than the equivalent apparatus for continuous current motors.

The ordinary multiphase induction motor also compares unfavorably with the continuous current motor in respect of its availability for changes in speed. The continuous current motor can now be made to give varying speeds through any necessary range without much loss of efficiency, the only consideration being cost. Hitherto the induction motor has not been able to meet this requirement. This latter disability is less serious than is generally supposed, because the cases requiring a smooth speed-change are comparatively few, and where they exist they have been in many instances dealt with by mechanical means.

Where very frequent starting and stopping have to be combined as they often are with gradually varying speed, something new must be attempted if the alternating motor is to take the field. The author has been at work on this problem for some years with the result that he claims to have solved the problem, and that he can meet most of the demands which are likely to arise in practice and deal with some new fields of enterprise which have hitherto, for various reasons, remained closed to the electrical engineer.

Hitherto the use of electric motors

*Institution of Engineering and Ship Builders in Scotland.

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

for marine propulsion has been confined to small craft, such as submarines, and one or two small barges and other craft on the Russian rivers and canals. A small electrically operated and propelled dredger has also been constructed in Germany.

The motors in these cases are continuous current machines.

The continuous current motor which is so convenient for small applications of power up to 100 horsepower becomes less convenient over this size. Above 1,000 horsepower it is not a very practical machine for power purposes where starting and stopping have to be frequently accomplished, and it is not specially suitable for marine work. The multiphase induction motor on the other hand has all the properties to be desired in a marine motor except hitherto the facility of speed control. This problem may now be said to be solved.

Some years ago the idea of rotating the outer member of the motor, usually called the stator, occurred to the author, and appeared to offer a solution of the starting difficulty, and this suggestion was made at a meeting of the Institution of Civil Engineers in 1904. The proposal was that the external member should be mounted so as to be free to revolve concentrically with the rotor or armature of the motor. The armature being connected to the load and the outer member being free to rotate, the outer member starts to revolve in a direction opposite to the working direction of the rotor, and having only its own inertia and friction to overcome, it quickly reaches synchronous speed. The motor is now in a position to develop its full load torque with full load current, and all that is necessary is to apply a mechanical or other brake to the external member, bringing it to rest gradually while the rotor starts and accelerates as the outer member or "spinner" comes to rest. The start can thus be made without excessive calls for current and without jerk.

This idea soon developed into a proposal to modify the ordinary working speed of the motor by so arranging the external member that it could be driven at any desired speed by gearing interconnecting both members, and an arrangement was worked out and patented for putting this idea into practical shape. It will be seen that by the use of a fast and loose pulley or friction clutch to transmit a part only of the power of the motor the starting can be accomplished with a very small loss of energy. This method, although serving the purpose for which it was designed and giving a useful solution of the difficulty, did not appear to be the final stage. The idea of rotating the outer member and controlling its speed suggested the idea of controling its motion independently of gearing or other arrangements which involved disadvantageous complications, and the simple apparatus now exhibited was evolved, which entirely gets over the difficulty of starting, and gives a change of speed in either direction. In this machine the outer member or spinner is made to act as the inner member or rotor of a second motor, the stator of which embraces the spinner. The machine is thus two motors concentricallly arranged round the common axis. The three speeds which may be described as prime, secondary, and tertiary are attained without loss of efficiency, but if intermediate speeds are desired they are obtained by a slipping brake or external resistance in each case equally with a consequent loss of efficiency. This loss of efficiency is very small, and is less than the loss involved where series wound continuous current motors are used for speed variations; or intermediate speeds may be obtained by providing a separate supply of current to the external motor and changing its speed by change of periodicity of the supply.

The attainment of three speeds without any loss of efficiency in this class of motor is a very important improvement, because it at once renders it available for such work as steel rolling mills, haulages, hoists, calendering and printing machines, lathes and boring mills, and last. and perhaps the most important of all, driving vehicles either on or off rails, including vessels on the sea.

A proposition to apply electric motors to drive a ship involves primarily a consideration of the conditions with respect to the propeller and the prime mover. Naturally, the propeller with its shaft comes first, as upon its efficiency of transformation of energy depends the size of the prime mover. It is necessary to institute a comparison for any given ship of the normal propeller as used with existing machinery, and see what are the prospects of economy by the substitution of electric transmission for the direct connection between the engine and the screw.

At first sight it does not appear that any economy could be made by the introduction of two successive energy transformations in the dynamo and motor respectively to take the place of a direct transmission.

The maximum possible efficiency of these two transformations with the transmission shaft is not more than about 88 per cent; while the efficiency of the direct transmission shafting is probably not less than 95. We thus have a loss of at least 7 per cent as a primary handicap against the proposal. This consideration may be taken as disposing of the possibility by change of transmission of any economy in ships of moderate size with slow-running propellers of upwards of 70 per cent efficiency. If electric driving is to be introduced into such ships it must be on other grounds than propeller economy. The case is different on coming to deal with ships in which the power is large and the propellers are run at a high speed. Such cases are becoming common in vessels driven by steam turbines. A very short incursion into the study of propellers is sufficient to show the trend of the conditions which here emergg.

The subject has been treated in some detail in Prof. Biles' book on "The Marine Steam Turbine," 1906, where are given the results of researches on propellers and the methods generally adopted in the design of propellers are fully explained. The causes of loss of efficiency in turbine vessels due to adopting propellers too small for the best efficiency are also discussed in the same book.

A ready and convenient method of making comparisons without the detailed labor of designing groups of propellers is desirable in the present connection, and for this purpose the author has developed a method.*

It will be seen that for any given ship, the designer who is at liberty to choose a large propeller for any given power has considerable advantage, as the efficiency may be as high as 70 per cent, and as low as 45 per cent. To say what improvement is possible in any case is by no means an easy matter, because the actual efficiency of any given propeller is often unknown; but the difference in efficiency between the probable bests when the diameter can be changed, may be found approximately, and it is this which has been attempted. The introduction of electric drive enables one to include in the consideration all speeds of revolution of the propeller, both low and high.

In seeking for higher efficiency in the propeller, the limits imposed by practical considerations must, of

*See "Note" in Appendix.

Generated on 2024-08-28 16:20 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

course, be taken into account, such as the beam and draught of the vessel. On the other hand, the revolutions at which the propeller may be efficiently used are fixed by the diameter and pitch.

While, therefore, one may have ascertained what is the possible improvement in efficiency, one must, before claiming the possibility of such improvement, deal with the problem with the limiting diameter of the propeller as a first element in the calculation.

It is this consideration which makes any saving in propeller efficiency difficult in high speed passenger steamers of shallow draught. The difficulty of improving the efficiency of ships of moderate size with slow-running propellers has been shown, so that the most attractive field of enterprise, from the propeller point of view, is in large ships of deep draught and high speed. Coming to the consideration of the prime mover, the scope of operations appears to be much wider.

If the ship is to be electrically driven, it will probably be found that the most convenient steam prime mover will in all cases be a turbine. The limit of speed of rotation, when the turbine is to be used for driving a dynamo or alternator, is of a different order altogether from the limit of sped imposed upon the turbine by its direct connection to the propeller. In some cases it will be easy to adopt an increase of 10 times in the speed of revolution. High speed of the turbine means high efficiency, and therefore the turbo-electric generator with its motors compares favorably in economy, cost, and weight with the marine steam turbine directly connected to the propeller shaft, and therefore running at a speed lower than that called for by considerations of steam economy in the turbine.

The reversibility and speed variability of the electric motor driven by the turbo generator, run unidirectionally at constant speed, dispenses entirely with the objectionable heavy and costly go-astern turbines mounted on the propeller shaft.

The marine steam turbine has already fairly established its claim to economy in cases where the requirements of the propeller permit of a reasonably high speed of rotation relatively to the power used, and therefore a direct comparison may be made of the results to be obtained on a ship of large size driven direct by steam turbines, with what can be done by the application of electric gear.

The ship has in the first case a total of 17,000 horsepower delivered to the three propellers, and a speed of 20¾ knots. The propellers are 8 ft. 1½ in. in diameter, and the speed of revolution is 377 per minute. This example is worked out in detail in the appendix, and it is there shown that the maximum probable efficiency of these propellers is 62 per cent, a figure which certainly does not err against the propeller in question.

An electric equipment would permit of the use of propellers of about 14 feet diameter at 140 revolutions per minute, and an efficiency not less than 70 per cent—an improvement more than sufficient to cover the loss in the electric motors.

It is further to be noted that the slower speed propellers would be free from the risks of cavitation troubles, which arise when the resistance is increased on a propeller already producing a high value of thrust per unit area. No attempt is made to put a figure on the economy emerging under this head, but its importance is evident.

Turning now to the generators, it will be found that the steam turbo-alternator as used on land in sizes corresponding to those now under discussion, can deliver an electric horsepower to the motors of 12.2 pounds of steam per horsepower hour, allowance having been made for all intermediate losses, and for 4 per cent for driving auxiliaries, no superheat being used, so as to make the comparison with normal marine practice. This figure is startlingly lower than anything which has been touched at sea. It is for full speed and power, but the comparison must also be made at low speeds and powers, and more particularly at the normal working speed of the ship.

It will be found that there is certainty of economy in this comparison, again because of the higher speed of revolution of the turbine, which in the electric case runs at the same speed for all powers, while, of course, the direct connected turbine must vary its speed of revolution with the speed of the ship.

It is not possible to base any generally conclusive argument on these data, but there is evident encouragement to give detailed study from this standpoint to any particular case which may arise. The same limitation applies to weight and cost. In the example referred to an estimate has been made of the weight, with the result that it appears probable that the decrease in the weight of the steam equipment will more than compensate for the heavy slow-running motors and propellers so that the weight will not be greatly changed. The cost will probably closely follow the weight.

Figs. 1, 2 and 3 illustrate a small 5 horsepower model of a three phase

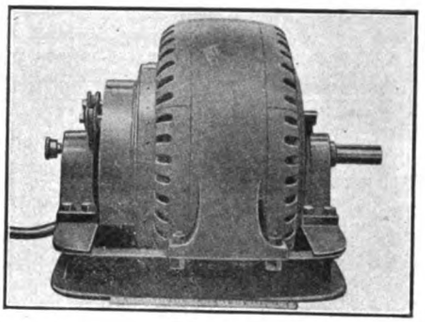


FIG. 1.

alternating current "spinner" motor for ship propulsion. This motor is shown in elevation and part longitudinal section in Fig. 3.

The electric current is delivered from an outside source to the primary windings of the stator and spinner respectively, passing in each case through a simple reversing switch which determines the direction of rotation. The stator circuit also supplies a magnet, which, when no current is passing, releases a brake which brings and keeps the spinner at rest. When current is passing, the magnet lifts the brake and leaves the spinner free to revolve.

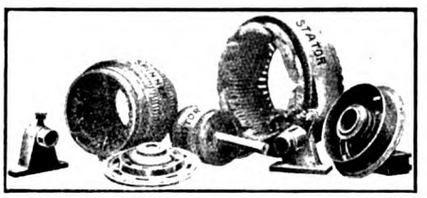


FIG. 2.

The three-speed motor provides a means of obtaining all the speed variations which are required on a ship. The intermediate speeds between the three normal speeds of the motor are obtained by variations in the speed of the generating plant, which are within the limits of practicability and economy. Each propeller shaft is provided with a directly connected motor on which there is co-axially superimposed a second motor for speed regulation. The regulating motor is mechanically connected and magnetically entrained with the first

Generated on 2024-08-28 16:17 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

in such manner that the speed variation may be effected as follows:

For slow speed, by running the regulating motor in the reverse direction to the direct connected motor.

For intermediate speed, by running the direct connected motor alone, the regulating motor being stopped.

For full speed, by running the regulating motor in the same direction as the direct connected motor.

This arrangement requires no spur wheels or friction gearing. Each motor is controlled by a simple reversing switch without any other mechanism, and there are no power-wasting devices.

The advantages of the adoption of this system are well illustrated in the case of a ship of 17,000 horsepower on three propellers at 21 knots maximum speed. At full speed the 17,000 horsepower is provided by one turbo generator of 10,000 horsepower which directly drives the direct connected motors, and by a generator of 7,000 horsepower which drives the regulating motors, the whole plant being run at full speed and full power. When the speed is dropped from 21 knots to 18 knots, the 7,000 horsepower turbo generator is stopped, and the coal consumption per horsepower is the same at 18 knots as at full speed. When the speed is further reduced the 10,000 horsepower may be stopped and the smaller unit again applied.

It will thus be seen that in addition to the economy attainable at full speed there is a very great improvement in economy at all lower speeds, owing to the possibility of choosing a suitable size of power unit for each speed. This advantage also appears in cases where the power required to drive the ship, at any given speed, is varied by the condition of weather or load; in short, the electric arrangements provide a means of approximating at all working speeds of the ship to the economy attainable on the trial trip at full speed. It is, of course, obvious that at very low speeds of the ship the economy cannot come within this region, but on the electric arrangements it is very much better than attainable by the ordinary means.

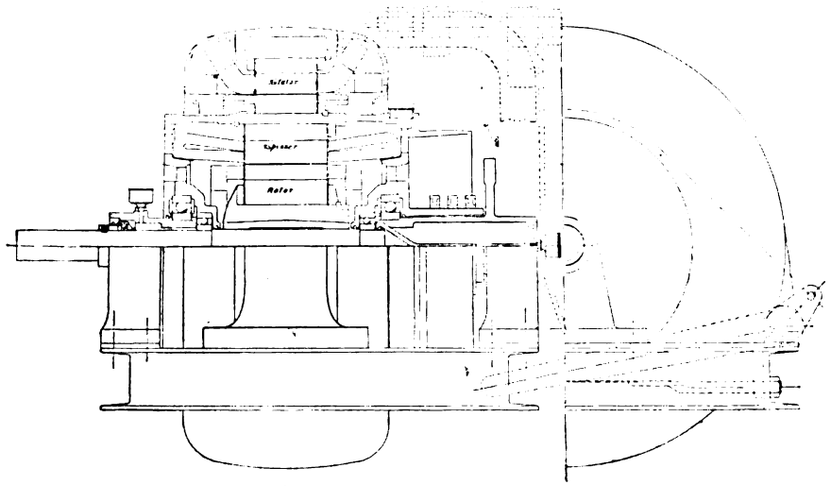


FIG. 3—ELEVATION AND SECTION.

The model has been made with ball bearings, but it is not proposed to use these in the actual machine which will be arranged as shown in Fig. 4. The rotor circuit and the induced circuit on the spinner are permanently closed, being of what is known as the "squirrel cage" type, the simplest of all forms of winding.

Figs. 4 and 5 show the longitudinal and cross sections respectively of the engine room arrangement of a cargo vessel fitted with reciprocating engines of about 1,200 horsepower, and supplied with steam from two boilers. This ship is constructed under the patents of Henry Burrell, who has been good enough to supply the author with the drawings. The existing plant is shown in shade. The equivalent electric plant is shown in outline. The space occupied and weight are about the same in each case.

This paper is an incomplete treatment of the subject, but it may serve to elicit a discussion interesting to members of the institution and others.

The author acknowledges gratefully his indebtedness to Thomas Bell, who specially directed his attention to this subject, to Prof. Biles, who has for many months lent his knowledge and experience in preliminary discusssions, and who it may be hoped will contribute to the public discussion, also to Mr. Luke, Mr. Cleghorn and to Dr. Caird, all of whom have taken a lively interest in these investigations and proposals.

APPENDIX.

NOTE ON SCREW PROPELLERS.

The propeller is one of the many things on which Professor Macquorne Rankine turned the searchlight of his genius, and the writer was, early in his investigations, referred to an interesting paper by W. McEntreé on "The Limit of Propeller Efficiency,"* where he showed that a curve of "ideal efficiency," drawn in accordance with Rankine's suggestions, could be compared with the results of Taylor's experiments, which are well known to naval architects.

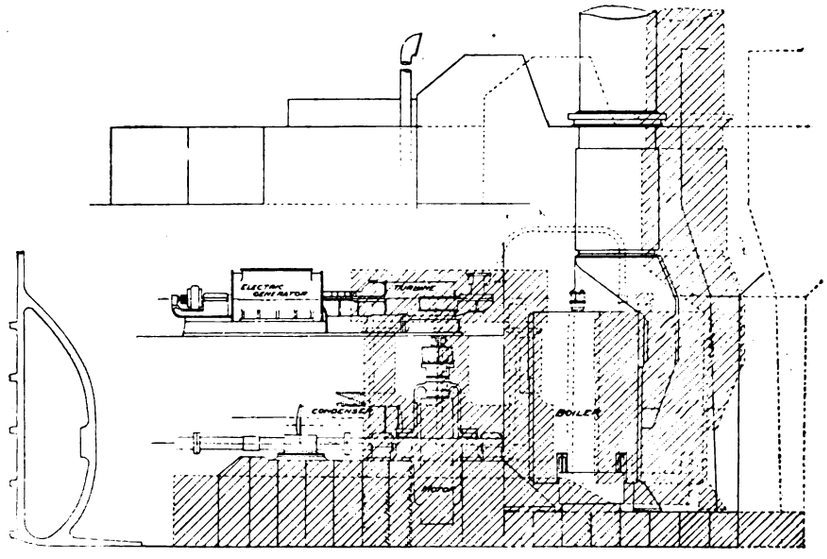


FIG. 4—LONGITUDINAL SECTION.

*Trans. American Institution of Naval Architects, 1906.

Generated on 2024-08-28 16:15 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The present writer had found Rankine's conception of "Ideal Efficiency of Steam Engines" so useful in getting for steam engines exactly what is here wanted for propellers, that this method of treatment was very attractive.

Referring now to McEntree's paper on "The Limit of Propeller Efficiency," of 1906, his statement of the case may for convenience be modified so as to obtain a curve of ideal efficiency in terms of B. H. P. / $d^2 v^3$, extending the argument so as to include the effect of the wake, and also, in proceeding, to suggest the conception of ideal slip and ideal pitch.

Following are the definitions and symbols adopted:

A = area of the propeller disc = $\frac{\pi d^2}{4}$ in feet².

d = diameter of propeller in feet.

e = ideal efficiency = $\frac{\text{Useful work}}{\text{Gross work}}$

E = actual efficiency.

g = acceleration due to gravity in feet per second per second.

G = gross horsepower delivered to propeller = B. H. P.

M = mass of the sternward column acted on by propeller per second.

p = pitch ratio of propeller, pd = pitch.

p_i = imaginary pitch ratio assumed for ideal propeller, and deduced from the pitch ratios for maximum efficiency in Taylor's experiments on propellers of .2 width ratio.

P = push or thrust delivered to the ship by the propeller in pounds.

R = revolutions per second of the propeller.

s is defined by $v_1 = Rdp_i\ (1 - s)$. and is the carry of the ideal propeller relative to still water in which it is imagined to travel. *This is not equivalent to what takes places when a nut slides over the threads of an overhauled screw.*

s_a = the apparent slip of the actual propeller relative to the ground over which the ship travels when there is no wake, *i. e.*,

$$\frac{v_1}{Rdp} = 1 - s_a$$

This is assumed as the probable best slip for maximum efficiency of actual propellers, and is deduced from the results of Taylor's experiments and their practical application to design.

s_ω is defined by $v\ (1-x) = Rdp\ (1 - s_\omega)\ (1 - x) = Rdp_i\ (1 - s)$, and indicates the changed ideal apparent slip theoretically occurring when a forward motion is assumed for the water in which the ideal propeller is imagined to move.

The suffixes indicate the values of x, which give the ideal values $s_{\omega\cdot1}$, $s_{\omega\cdot2}$ etc.

$s_{a\cdot1}$, $s_{a\cdot2}$ etc., indicate the probable actual values of the apparent slip, and these values are obtained by deducting the corresponding values of $s - s_{\omega\cdot1}$, etc., from s.

The suffixes indicate the values of x, which will give the apparent values of s_a.

s_p = the slip = $s_a - s$ which takes place on an actual propeller and corresponds to the slide of a nut jumping over the threads of an overhauled screw. To compensate for this slip involves an increase in pitch of the screw, as compared with that of the ideal propeller.

$$s + s_p = s_a.$$

x = ratio of speed of wake to ship speed over the ground in the same direction.

vx = speed of wake over the ground.

$v - vx = v\ (1 - x) = v_1$.

v = speed of the ship, or of the ideal propeller relative to still water or over the ground, in feet per second.

v_1 = speed of ship or of the ideal propeller relative to the water in which it moves, in feet per second.

v_2 = speed of the ideal sternward column over the ground, in feet per second.

W, $W_{\cdot1}$, $W_{\cdot2}$ = $\frac{G}{d^2 v^3}$ when the water is in motion and wake ratio x = .1 .2, etc.

$\psi = \frac{\text{B. H. P.}}{d^2 v_1^3} = \frac{G}{d^2 v_1^3}$.

W = weight of 1 cu. ft. of sea water = 64 lbs.

The following is a

DEVELOPMENT OF RANKINE'S "IDEAL" FORMULAE.

$P = Mv_2$, $M = \frac{WA}{g}(v + v_2)$, $v_2 = Rdps$,

$v_1 = Rdp\ (1 - s)$.

Useful work per second = Pv_1.

Lost work per second = $\frac{Pv_2}{2}$

Gross work per second = $P\left(v_1 + \frac{v_2}{2}\right)$.

$$\text{Efficiency} \quad \frac{1}{1 + \frac{v_2}{2v_1}} = e.$$

$$\frac{v_2}{v_1} = \frac{RDps}{RDp\ (1-s)} = \frac{s}{1-s} \quad \therefore \quad e = \frac{1-s}{1-\frac{s}{2}} \quad \cdot \quad \cdot \quad \cdot \quad (1)$$

$$\text{Gross work in horse-power} = G = \frac{64\pi\ d^5\ R^3\ p^3 \left(s - \frac{s^2}{2}\right)}{550 \times 32{\cdot}2 \times 4},$$

and

$$\frac{G}{d^2 R^3} = {\cdot}00285\ p^3\ s\left(1 - \frac{s}{2}\right) \cdot$$

$$= \frac{G}{d^2 v_1^3} p^3\ (1-s)^3,$$

$$\therefore \psi = \frac{G}{d^2 v_1^3} = \left(\frac{1 - \frac{s}{2}}{1 - s}\right)\frac{s \cdot 00285}{(1-s)^2}, \quad \cdot \quad \cdot \quad (2)$$

$$v_1 = v\ (1 - x) = Rdp_i\ (1 - s_\omega)\ (1 - x) = Rdp_i\ (1 - s),$$

and

$$\frac{1-s}{1-s_\omega} = 1 - x, \quad \cdot \quad \cdot \quad \cdot \quad (3)$$

$$W = \frac{G}{d^2 v^3} = \psi\ (1-x)^3 = \frac{G\ (1-x)^3}{d^2 v_1^3} \quad \cdot \quad (4)$$

Let $W = \frac{G}{d^2 v^3}$, when $x = 0$,

$W_{\cdot1}$ = " " $x = {\cdot}1$,

$W_{\cdot2}$ = " " $x = {\cdot}2$, etc.

These equations have been applied to given values of s, and the results are stated in

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Table I and plotted to the base ψ in Diagram 1, which also includes scales for converting ψ into W.

The efficiency being plotted to the base ψ the curves derived from Taylor's experiments (see Table II) are plotted to the same base (see diagram), and it is found that the two curves, as has been pointed out by Mr. McEntree, bear a constant ratio to one another throughout the range of the experiment. This ratio is for the .2 width ratio, $\frac{80}{95}$, *i. e.*, the efficiency on Taylor's experiments is .84 of the ideal efficiency of this width ratio.

$$\frac{\text{B. H. P.}}{d^2 v_1^3} p^3 (1-s)^3 = \frac{\text{B. H. P.}}{d^5 R^3}$$

is very nearly a constant for each width ratio at all *maximum efficiencies.* The constant is for the 3-bladed .2 width ratio propellers

$$\frac{\text{B. H. P.}}{d^5 R^3} = .000595.$$

As the B. H. P. required to drive the propellers for any given thrust is directly proportioned to the efficiency, the ideal B. H. P. will be inversely proportioned to the relative *maximum efficiency* of a similar propeller in Taylor's curve, *i. e.*, if the propeller in Taylor's curve takes

B. H. P. $= d^5 R^3 \times .000595.$

Ideal B. H. P. $= d^5 R^3 .00595 \times .84 = .0005.$

(It may here be noted that $\frac{\text{B. H. P.}}{d^5 R^3}$ is of the dimensions of density,

Feet. Lbs. Mins.

$$\text{i. e., } \frac{\frac{L}{T^2}\ \frac{ML}{T}\ \frac{I}{M.}}{\frac{1}{L^5}\ \frac{}{T^3}} = \frac{}{L^3} \text{ a density}$$

Ft. Rev. per Min.

Referring back to the fundamental equation (2) for ideal B. H. P. it will be noted that it includes the factor "W" = 64 representing the density of the water.)

On Diagram 1, it is assumed that as the result of Taylor's experiments (see Diagram 2 and Table II) an ideal pitch line may be plotted to correspond with the ideal slip, and that a probable pitch line may be plotted for any other slip on the assumption that the constant $\frac{G}{d^5 R^3}$ is inversely proportional to the maximum efficiency.

The ideal pitch line has been put on Diagram 1 from the formula

$$\psi\ p^3 (1-s)^3 = .0005.$$

This curve suggests the notion that under no circumstances can a low pitch ratio give an efficient propeller. Plotting also on Diagram 2, the values of slip in Taylor's experiments with three width ratios, we find that the slip follows generally the line of the ideal slip.

The curve "probable maximum efficiency," Diagram 2, is 90 per cent of the efficiency for .2 width ratio propellers in Taylor's experiments, and the value of $\frac{G}{d^5 R^3}$ is therefore assumed to be for maximum efficiency.

$$\frac{.000595}{.9} = .00066 = \psi\ p^3\ (1-s)^3$$

In plotting a curve, Diagram 2, of the probable slip for this group, the author simply enclosed Taylor's experiments in an enveloping curve, because they have been adopted as giving the nearest values attainable of the proper slip for maximum efficiency, and from these values is derived the pitch curve for $\frac{G}{d^5 R^3} = .00066$.

The curve of actual apparent slip could be deduced from that of ideal apparent slip by the following simple experiment.

The ship is moored, the propeller driven at R revolutions per second, and the velocity of the sternward column v_2 measured by means of a patent log.

Then the imaginary pitch ratio p_i is given by the equation

$$p_i = \frac{v_2}{Rd},$$

but

$$1 - s = \frac{v_1}{Rdp_i} \text{ and } 1 - s_a = \frac{v_1}{Rdp},$$

$$\therefore s_a = 1 - \frac{(1-s)\ v_2}{Rdp},$$

and if the torque horsepower be also measured, the value ψ may be obtained.

COMPARISON OF PROPELLERS.

For comparison of propellers on this method the following data are required:

G, v, d, p, R,

from which can be deduced $\frac{G}{d^5 R^3}$, $\frac{G}{d^2 v^3}$, s_a and approximations to the following

TABLE I.

FUNDAMENTAL EQUATIONS. 1. 2. 3 and 4.

s	$1-s$	$1-\frac{s}{2}$	$(1-s)^3$	e	ψ	$.1=x$ $s\omega_{.1}$	$.1=x$ $\omega_{.1}$	$.2=x$ $s\omega_{.2}$	$.2=x$ $\omega_{.2}$
.05	.95	.975	.8574	.974	.000162	.05	.000118		.000033
.1	.9	.95	.729	.948	.000371		.000271	—.125	.00019
.15	.85	.925	.6141	.919	.000643		.000469		.000329
.2	.8	.9	.512	.889	.00100	.1	.000729	.000	.000512
.25	.75	.875	.4219	.857	.001475		.001075		.000765
.3	.7	.85	.343	.823	.00212	.2	.001545	.125	.001085
.35	.65	.825	.2746	.788	.00300		.00219		.001535
.4	.6	.8	.216	.75	.00422	.3	.00308	.125	.00216

Diagram 1 represents these relations.

TABLE II.

TAYLOR'S EXPERIMENTS. 3 BLADED PROPELLERS.

S	.2 W R s	.2 W R p	.2 W R $\frac{S}{(1-s)^3 p^3}$	.275 W R s	.275 W R p	.275 W R $\frac{S}{(1-s)^3 p^5}$	.35 W R s	.35 W R p	.35 W R $\frac{S}{(1-s)^3 p^3}$
.2	.14	1.318	.290	.168	1.436	.313	.16	1.47	.376
.25	.16	1.275	.307	.19	1.418	.378	.19	1.44	.397
.3	.1775	1.24	.318	.21	1.395	.402	.21	1.416	.422
.4	.2065	1.175	.325	.24	1.344	.434	.2425	1.362	.450
.5	.23	1.125	.325	.261	1.295	.439	.266	1.32	.455
.6	.251	1.084	.320	.278	1.248	.440	.284	1.28	.462
.75	.28	1.035	.310	.30	1.172	.415	.307	1.23	.466
1.0	.317	.98	.300	.326	1.08	.386	.334	1.15	.445
1.25	.347	.95	.300	.347	1.005	.356	.357	1.08	.423
1.5	.361	.93	.300	.363	.95	.333	.347	1.016	.390
1.75	.3895	.90	.290	.3775	.90	.310			
2.0	.4065	.88	.283	.39	.866	.30			

An examination of Taylor's experimental data (see Table II) of *maximum efficiency* with the relative slip and pitch plotted to the base ψ, as in the ideal curve, brings out the interesting fact that for the 3 and 4-bladed propellers the value

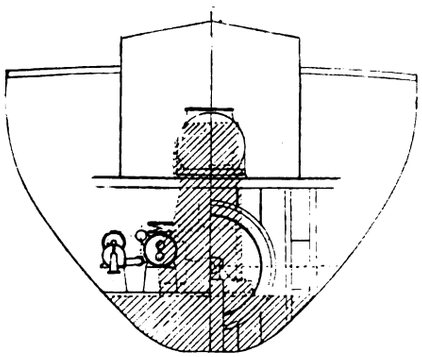


FIG. 5—CROSS SECTION.

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

from Diagram 1.

W and its suffix, by inspection of the apparent slip curves s_a and scales of W, the co-ordinate points on each can be found.

$$\psi = \frac{W}{(1-x)^3},$$

x is indicated by the suffixes to s_a and W.

s_p by difference betwen s_a and s.

e from Diagram 1, where e is plotted to base ψ.

E from same ordinate in Diagram.

$\frac{G}{d^5 R^3}$ approximately $= \frac{.0005}{E}$ for maximum efficiency.

The values are indicated thus † on diagram.

EXAMPLE A.

$G = 5660$

$$v = \frac{20.75 \times 6080}{60^2} = 35$$

$d = 8.125$

$p = 1$

$R = 6.283$

$$\frac{G}{d^5 R^3} = \frac{5660}{8.125^5 \times 6.283^3} = .00054 = \psi p^3$$

$\frac{}{(1-s)^3}$

.00064 is the actual value of $\psi p^3 (1 - s_a)^3$, deduced from the curve of efficiency E. This propeller has, therefore, been designed to give the maximum efficiency under the given conditions, and it probably does so.

$$W = \frac{5660}{8.125^2 \times 35^3} = .002$$

$$1 - s_{ax} = \frac{v}{Rdp} = \frac{35}{6.283 \times 8.125 \times 1} = [.685$$

$s_{ax} = .315$

The ordinate, which gives $s_{ax} = .315$, and the abscissa, which gives $W = .002$, are respectively in the scales $s_{a\cdot 05}$ and $W_{.05}$ *i. e.*, the points are halfway between .1 and 0,

$\therefore x = .05$

$$\psi = \frac{W}{(1-x)^3} = \frac{.002}{.85} = .00235$$

$s_p = .08$

$e = .81$ E .62

It is now required to find the dimensions of new propellers electrically driven to develop the same thrust. The thrust H. P. $= 5660 \times .62 = .3510$. It is proposed that the propellers should have an efficiency of 70 per cent $\therefore G = 5010$.

$$\frac{G}{d^2 v_1^3} = .0007 = \psi.$$

The wake value as before .05

$\therefore W_{.05} = \psi \times .95^3 = .0007 \times .85 =$ [.000595,

$$\text{and } d^2 = \frac{5010}{.000595 \times 35^3} = 196$$

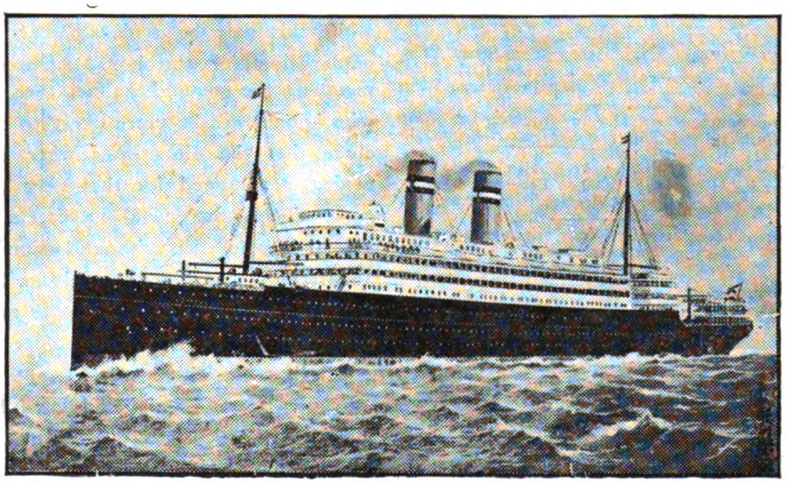
$d = 14$

$$\text{If } \frac{G}{d^5 R^3} = .00064_1, \quad R^3_1 = 14.5$$

$R = 2.44$

THE ROTTERDAM, THIRD LARGEST LINER.

The Holland-America line entertained a large company to dinner last week on board the Rotterdam, the latest addition to the great trans-Atlantic ferry, the occasion being the maiden voyage of the vessel and her first appearance in the harbor of New York. Before dinner the guests had an opportunity of inspecting the Rotterdam, which, as the accompanying illustrations show, is a remarkably handsome and commodious vessel, and the unanimous opinion was that, so far as elegance of appointments and consideration for the comfort of the passenger are concerned, the Rotterdam ranks among the finest vessels in the trans-Atlantic service.



S. S. ROTTERDAM.

The Rotterdam was built by Messrs. Harland & Wolff, Ltd., at Belfast, Ireland, and was launched on March 3. Her general dimensions are: Length, 677 ft.; width, 78 ft., and depth, 56 ft. She is of 24,170 tons register, 37,190 tons displacement, and has a carrying capacity of upward of 20,000 tons. Twelve transverse and one longitudinal bulkheads divide the hull into 18 watertight compartments, the double bottom being divided into 30 water-tight compartments. Her propelling machinery consists of twin-screw quadruple-expansion engines of over 28,000 H. P., driving the vessel at an average speed of 18 knots per hour.

There are accommodations on the vessel for 525 first cabin, 515 second cabin and 2,500 third class passengers. With her crew of 475 persons the total carrying capacity is over 4,000. There are 265 first cabin state rooms, 48 of which have private bath and toilet rooms, 87 have single accommodation, and there are 12 suites consisting of private bed, sitting and bath rooms. The dining room extends over the entire width of the vessel, is 92 ft. in length, and exceptionally beautiful in decorations and appointments. The social hall covers an area 56 by 39 ft., is equipped with a Steinway grand piano and a Mason and Hamlin organ, and has among other decorations a large tile picture representing a view of old "Rotterdam," after Klingenburg. The palm court measures 50 by 42 ft., decorated in cream lacquer, period Louis XVI, and is decorated with large tiles from the Delft Art Pottery Works, with alternate triple windows of decorative burnt glass set in gilt bronze. The panels are of special design.

The upper and lower smoking rooms are connected by a stairway, and are furnished in Dutch Renaissance style, and are exceedingly comfortable. The library is also a notable feature, and is splendidly equipped. The accommodations for second cabin passengers have been planned on an unusually liberal scale, as have also the third class.

The Rotterdam is equipped with submarine signal-receiving apparatus, Marconi long-distance wireless telegraph system, and an excellent system of fire alarm, fire protection and extinguishing apparatus. An electric passenger elevator facilitates communication between the different decks. The lifeboats, of which there are 18, are equipped with the Welin quadrant davit.

Generated on 2024-08-28 16:22 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Co.

CLEVELAND.

BOSTON.....73-74 Journal Bldg.
BUFFALO.....932 Ellicott Sq.
CHICAGO.....1328 Monadnock Blk.
CINCINNATI.....First National Bank Bldg.
NEW YORK.....1005 West Street Bldg.
PITTSBURG.....510 Park Bldg.
DULUTH.....411 Providence Bldg.

Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.

Subscription, U. S. and Mexico, $3.00 per annum. Canada, $4.00. Foreign, $4.50. Subscribers can have addresses changed at will.

Change of advertising copy must reach this office on Thursday preceding date of publication.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C., England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

July 2, 1908.

BRITISH ICE CRUSHERS FOR CANADA.

ICE-BREAKER FOR THE CANADIAN GOVERNMENT.—The *London Engineer* reports that an order for another ice-breaker has been placed by the Canadian government with Messrs. Vickers Sons & Maxim, Ltd., Barrow. The vessel is to be 270 ft. long, 46 ft. beam, and capable of developing, on trial, a speed of 16 knots.

That the ways of government officials are devious and past finding out we are frequently reminded and that we enjoy no monopoly of this in the United States the recent action of the Canadian government in placing an order for another ice crushing steamer with an English firm is evidence. Canada pays a bonus to ship building plants as an assistance and encouragement in their maintenance for the very obvious purpose of encouraging the building and operating of ships, and then as soon as there is a bit of work for them to do and which properly belongs to them, totally regardless of any possible difference in price, sends it abroad.

It cannot be urged as a reason that a better ship can be had, because the ship builders of the great lakes, both Canadian and American, have had more experience with ice and ice-breaking craft than all the ship builders of the world put together. The only notable work in that direction done abroad has followed almost exactly the lines developed here, and some of the methods adopted in securing the information went far beyond the bounds of decency, to say nothing of honesty.

To be sure, it may be said that this second ice breaker cannot be taken through the canals, which is true, but, while this may be a plausible enough explanation for the house of parliament or the general public, the man who knows will be more likely to conclude that the dimensions were conveniently arranged for that very purpose. There are naval architects on the lakes who will, without hesitation, undertake to produce a ship within canal dimensions that will do far more execution on St. Lawrence river ice packs than the ship proposed and for less money. It is a well known fact that the boat having a form best adapted for ice work will never be driven at 16 knots per hour, we might safely say cannot be, and those who seek anything of the sort are either not informed on the subject or are simply throwing their money at the birds.

The Montcalm, the first ice-breaker ordered by the Canadian government and also built abroad, and recently sunk in collision near Quebec, was within canal dimensions, and it is perfectly safe to say that there are in Canada builders who would, without hesitation, undertake to build a boat her superior in every way for the purpose intended, if given the opportunity.

Patriotism is a good thing, but it must be more than skin deep to be genuine, and this action of the government, as well as that of sundry vessel owners who have had built in Great Britain within the past two or three years a large fleet of canal-sized steamers, seems to indicate that most of it is of that variety. The ship builders of Canada have invested their money in the face of very discouraging prospects and parliament has recognized that fact by conceding a bonus, of small proportions to be sure, but yet a help, while denying them the only really effective support and which is their right, an import duty on tonnage built abroad. How is it to be expected that a young industry, which steel ship building is in Canada, is to struggle to its feet while every owner who wants a ship not too large to pass the canals, can go to Britain and buy her at a somewhat lower price and bring her in duty free? It is a rank injustice to the Canadian builder and the government itself has added a foul wrong when it went abroad and placed orders for work that by every right belongs to him. The question of cost has no bearing on the case whatever.

CRAGG'S NEW SYSTEM OF SHIP CONSTRUCTION.

Considerable interest has been taken in British ship building circles in the announcement that Messrs. R. Craggs & Sons, ship builders, of Middlesbrough, have adopted an entirely new method of ship construction. It is said that the idea is to substitute longitudinal framing for the old method of transverse framing. Quarter pillars and hatch pillars are dispensed with, and the center pillars reduced to a minimum. In the new system the idea has been hit upon whereby longitudinal frame work could be simply and directly applied to the structure of the vessel as a whole, and it has now led, after most laborious investigations, to a complete and definite system of ship building, which enables the multitudinous transverse attachments which are the seat rather of weakness than of strength to be thrown to one side in favor of a continuous and homogeneous structure. It follows from what has been said, and also from the most important fact that the redistribution of material that has taken place has brought very nearly the whole of the steel in the vessel into the direction necessary to resist the greatest strains that a ship has to bear, viz., longitudinal strains. Between the frames and beams of the ordinary transverse-framed vessel there is nothing but the plate to resist the bending or breaking of the vessel between the frames, whereas under the new system, where the longitudinal position of all

Generated on 2024-08-28 16:14 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

frames, beams and floors is adopted, the whole framework also is brought into play to resist breaking or bending. Messrs. Craggs & Sons have already begun building on this new system, and it is understood that several eminent east coast and Scotch firms of ship builders are negotiating to adopt the system under license from the patentees.

ELECTRIC PROPULSION OF STEAMERS.

An important proposal for the electrical propulsion of ships has been laid before the Scottish Institute of Electrical Engineers at Glasgow by Henry A. Mayor, a well-known authority on this and kindred questions. Mr. Mayor says the steam turbine suggests a new starting point for re-examination of the problem of marine propulsion. The underlying principle of the proposal is the use of a high speed turbine running at a uniform velocity for all speeds of the ship, and driving a dynamo from which electrical power is taken to a variable speed motor or motors coupled direct to the shafts of propellers of maximum efficiency. The dynamo and motor here occupy an intermediate position between the power and the work, and in effect constitute a gearing which can submit to modifications of its own characteristics to meet the characteristics on the one hand of the prime mover, and, on the other hand of the machinery to be operated.

In regard to the objections hitherto urged against alternating currents, Mr. Mayor claims to have overcome them. The application of his system, he contends, would render the motor available for a great variety of industrial purposes, as it enables three speeds to be obtained without any loss of efficiency. He gives a comparison of a 1,700-H. P. steam turbine with three propellers and a speed of 20¾ knots, and the same with an intermediate electric equipment. In the first instance the propellers are 8 ft. 1½ in. in diameter, and the speed of revolutions 377 per minute. This gives on working out a probable maximum efficiency of 62 per cent. With the electric motor interposed between the steam turbine and the shaft drive, the propeller blade would be about 14 ft. in diameter, the speed 140 revolutions per minute, and an efficiency of not less than 70 per cent an improvement, Mr. Mayor holds, which would be more than sufficient to cover the loss in the electric motors.

THE DECK OFFICER IN THE MAKING.

The recent decision of the White Star Line to place in commission a training ship for mercantile marine officers is the outcome of investigations extending over some period on the diminishing supply of suitable officers for the large steamship lines. There is scarcely a trans-Atlantic line which has not, during the past year, added one ship or more to its fleet. When one considers that it does not seem so many years—in fact, we are not as yet afraid to count them—since the Teutonic and Majestic were the crack ships of the White Star Line, and ranked with the finest the trans-Atlantic ferry could show in speed, comfort and accommodation, the rapidity with which this popular line has added to its fleet, and the increasing size of each forthcoming marine leviathan, is a notable example of what can be done by one company in meeting the demand for greater accommodation for each class of passenger.

The demand for large and fast ships, however, means a corresponding demand for suitable officers. The passing of the sailing ship, through preference for steam-driven freighters, means a rapid decrease in the number of apprentice berths and the opportunities of learning seamanship with an eye to a captaincy. It has been said that while the ordinary apprentice training on sailing vessels has much to commend it, many apprentices have to perform tasks of a very menial description, neither useful for a seaman's training nor possessing any advantages educationally. The apprentice, however, performed the tasks set for him as all in the day's work, and, in later years, does not seem to be any the less an officer and gentleman through having had to rough it in the earlier days of his career.

There can be no doubt of the advantages to be derived from a cadet training, such as the White Star contemplates. The menial tasks aforementioned have deterred many young men who have enjoyed the benefits of higher education from embracing seafaring as a profession. On the training ship the cadets will be carefully instructed in the hands of an efficient nautical and educational staff, and will follow a systematic course of preparation. The board of trade has issued special regulations granting cadets who have had four years' instruction on recognized training ships the privilege of sitting for examination as second mate; the apprenticeship on the Mersey will be for four years.

The Mersey is a Clyde-built clipper ship 271 ft. in length and of 1,829 tons register. The staff of the ship will consist of commander, chief mate, first mate, second mate, surgeon, head master (nautical) and assistant master. There will be a full staff of petty officers and a number of able-bodied seamen. The Mersey has accommodations for about 60 cadets and has been overhauled and refitted for this service. The White Star Line is to be commended in thus taking the initial step toward insuring the supply of efficient deck officers in the future; that is, so far as the British flag is concerned. The large German lines have used this system for a number of years.

COMPRESSED AIR IN BRITISH AND AMERICAN SHIP-YARDS.

The progress in the use of pneumatic appliances in ship building in this country and particularly in the ship yards of the Great Lakes is brought out in a somewhat startling manner by consideration of an article in *London Engineering* of June 12 treating of the improvements at the yard of Harland & Wolff at Belfast which has long occupied the premier position among the ship yards of the world. The yard has evidently been undergoing material modifications and improvements, but the point we wish to draw attention to is the great disparity in the volume of compressed air to be supplied even under the new conditions as compared with typical lake yards. The compressors at the Belfast yard

Generated on 2024-08-28 16:17 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

(which it is noted are of American make), are driven by motors of 1,000 H. P., which at ordinary efficiencies is equal to compressing about 5,700 cu. ft. per minute to 100 pounds, the working pressure employed.

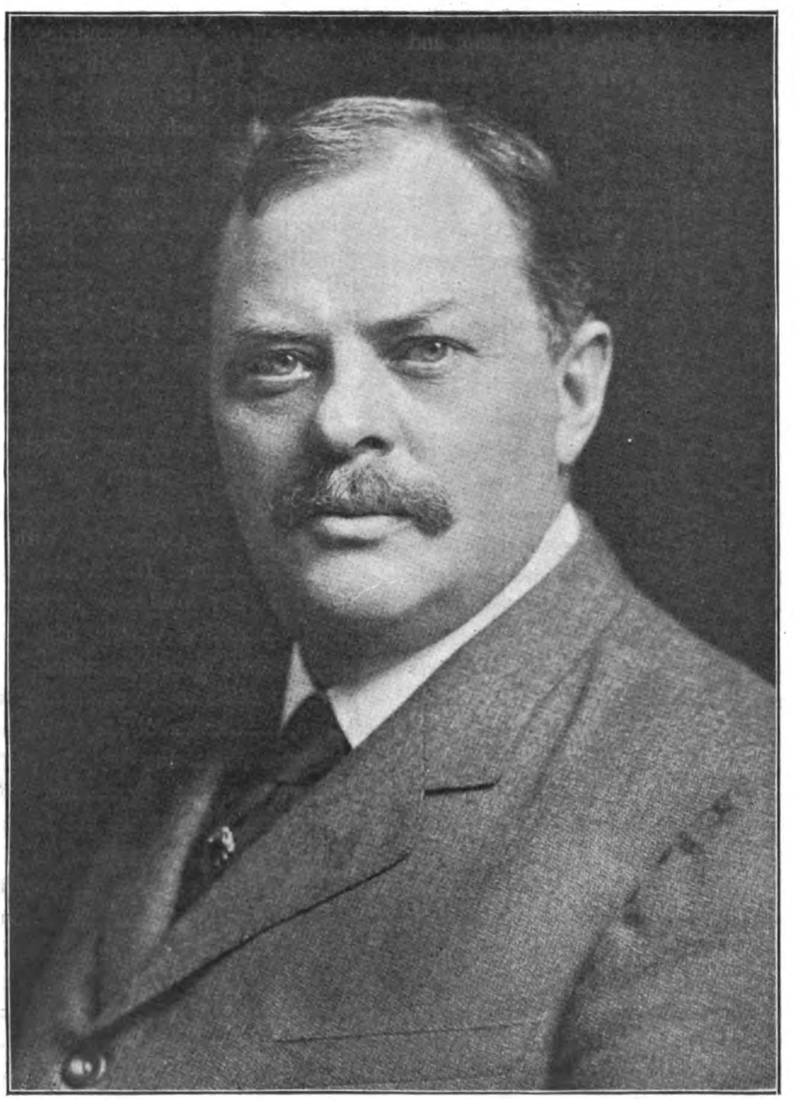
The use of air in lake yards goes far beyond these figures. At Lorain for instance, the compressor capacity is in excess of 9,000 ft. per minute, and at Ecorse, when the compressors now being installed are complete, the capacity will be over 12,000 ft. per minute. The working pressure is 100 pounds in all cases. It must be borne in mind however that at Belfast hydraulic power is used extensively for riveting in place of air, but even so, the combined power of both air and hydraulic plants falls far short of either of the yards mentioned when it is considered besides that they do not approach the Belfast yard in tonnage capacity, and that of the 800 H. P. of the hydraulic plant a large part is absorbed by the engine works and boiler shops.

The power absorbed in air compressing at Lorain and Ecorse is about 1,600 and 2,100 respectively, all of which goes into hull construction. Wtile it is true that the hydraulic plant is in some respects more efficient than air, its cost and lack of flexibility make it not only unprofitable but undesirable for all but exceptional work. The statement is made that hydraulic riveting has been found the more economical, but while this may have proved to be the case at Belfast, it is contrary to all experience in this country, and it is most probably due to failure to realize the possibilities of air tools. First class work has been done, and is done here on boiler work, on rivets up to 1¼-in. diameter, with air tools; above that hydraulic driving is still preferable. A complete hydraulic plant having sufficient capacity to drive rivets at the rate customary here would be an enormous investment in itself, even if it were otherwise feasible. It is recognized fully that there is much work at Belfast of a heavier nature than any coming to either of the yards mentioned, but the proportion of hand-driven rivets must still be much higher there than in any of the lake yards.

Launching the Daniel B. Meacham.

As distinguished a gathering as ever attended a lake launching witnessed the putting overboard of the bulk freighter Daniel B. Meacham at the Ecorse yard of the Great Lakes Engineering Works on Saturday last. The members of the American Society of Mechanical Engineers in session at Detroit attended the launching in a body as the guests of the ship building company. The company had chartered the new excursion steamer Britannia to convey the guests to the ship yard. En route a pennant bearing the emblem of the organization was flown at the bow of the Britannia. The steamer anchored in the stream directly opposite the launching slip so that everyone aboard had a perfect view of the event. The new steamer was christened by Miss Eliza Jane Kennedy, daughter of Julian Kennedy, of Pittsburg, the well-known engineer, and was named in honor of Mr. Meacham, who is a member of the firm of Rogers, Brown & Co. Regret was expressed that Mr. Meacham was not present. He is on a European trip but was represented by his son, R. B. Meacham. As usual, the launching was successful in every way, as is borne out by the pictures accompanying this article.

The launching party was tendered a luncheon at the Detroit Club at the conclusion of the launching. President Antonio C. Pessano presided and introduced Harvey L. Brown, of Buffalo, as toastmaster. Mr. Brown was extremely felicitous upon this occasion. His introductory speech was extremely amusing, including an excellent story upon the original ship builder, Noah. He was amusingly



MR. DANIEL B. MEACHAM.

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

satirical in his reference to the addition of another vessel to the present fleet now hustling and bustling in carrying cargoes from port to port in the season of 1908.

Julian Kennedy upon being called upon spoke very simply. He paid a tribute to the many sturdy qualities

HOISTING THE PENNANT ON THE BRITTANIA.

of Mr. Meacham and hoped that the boat named after him would for many years continue to expedite the commerce of the lakes, now so large and so rapidly increasing.

Mr. Brown in introducing Mr. Pes-

MISS ELIZA JANE KENNEDY, SPONSOR.

sano said that the Great Lakes Engineering Works had so systematized ship building that ships were now built at the yard while one waited. He congratulated the Great Lakes Engineering Works upon its excellent record.

Mr. Pessano in reply said that the Daniel B. Meacham represented the

THE LAUNCHING PARTY.

forty-ninth launching of the company in four years. Their first ship was launched on May 5, 1904. He admitted that such a record did resemble very much the manufacture of ships.

This led the toastmaster to reply that the forty-niners were gold seekers and he hoped that the new ship would find gold as well as they. A toast was then proposed to Miss Kennedy, the sponsor.

James E. Davidson stated that all of the ships built by the Great Lakes Engineering Works were good ships. He considered a ship to be about the biggest thing that an engineer creates, in that it is supposed to stand strains in all kinds of weather and to carry cargoes at all angles.

CAPT. THOMAS DERINGER AND MR. W. M. MILLS.

Mr. Cramp, of Philadelphia, felt that few appreciated what Mr. Pessano had accomplished because so few people understand what a ship really is. He thought it very wonderful that 49 such ships as he had seen launched that

MR. JULIAN KENNEDY.

day should have been built by one company in the brief space of four years.

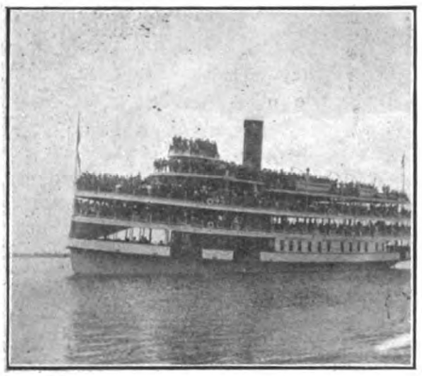
Brief speeches were made by Henry B. Smith, of Bay City, and W. M. Mills, of North Tonawanda. Those present were: Miss Kennedy, Mr. Julian Kennedy, W. P. Cheney, from

MR. STILLMAN, MR. W. I. BABCOCK AND MR. JOHN R. RUSSEL CLIMBING THE GANG PLANK.

Pittsburg; Wm. M. Mills, Mr. and Mrs. W. B. Kerr, Mr. and Mrs. Fred Rogerson, Mr. and Mrs. W. H. Hunter, from North Tonawanda; Capt. J. J. H. Brown, Mr. and Mrs. Harvey L. Brown, Capt. John Perew, C. W. Stith, from Buffalo; James Nacey, from

Generated on 2024-08-28 16:21 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Cleveland; James E. Davidson, Henry B. Smith, from Bay City; H. C. Sadler, from Ann Arbor; Mayor Thompson, Frank E. Kirby, Mr. and Mrs. Antonio C. Pessano, John R. Russel and H. W. Hoyt, from Detroit; Mr. Cramp, from Philadelphia.

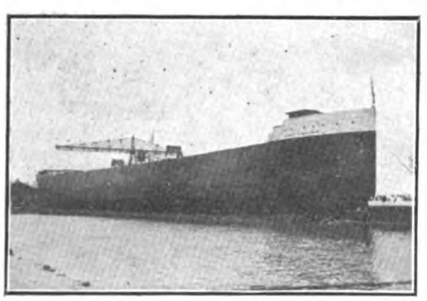


THE BRITTANIA ANCHORED OPPOSITE THE LAUNCHING SLIP.

The Meacham is the third ship to be built at this yard for the Frontier Steamship Co., of which W. M. Mills is manager. Like her sisters, the Josiah G. Munro and James Corrigan, she is 550 ft. over all, 530 ft. keel, 56 ft. beam and 31 ft. deep. In all her appointments she is unusually complete and represents the highest type of bulk freighter on the lakes. Her auxiliary equipment includes an Akers emergency steam steerer, which is steadily growing in popularity. Her construction for the owners is being looked after by Nacey & Hynd, of Cleveland. Capt. Thomas Deringer will bring her out.

FIRE BOAT JOSEPH MEDILL LAUNCHED.

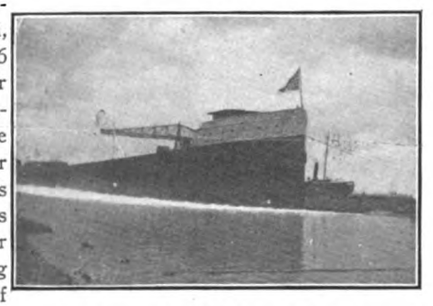
In the presence of more than 300 guests, including Mayor Busse and other officials of Chicago, the steel fire boat Joseph Medill, constructed for the city of Chicago, was launched from the yard of the Manitowoc Dry Dock Co., Manitowoc, Wis., on Tuesday last. The fire boat was christened by Miss Helen Geer, the six-year-old daughter of L. E. Geer, secretary of the ship building company. The launching party were later entertained at the City Club.



ON THE WAYS.

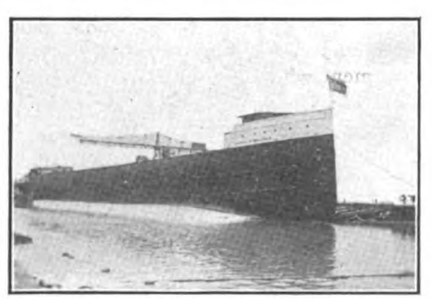
JUST TOUCHING THE WATER.

The Medill was designed by W. I. Babcock and was completely described in the MARINE REVIEW of April 2 last. The arrangement of the machinery on the Medill is novel in that the same engines are used for operating the fire pumps and operating the vessel, thus doing entirely away with separate propelling engines. Each pump is driven by a horizontal Curtis turbine of 660 H. P. built by the General Electric Co., of Schenectady, N. Y., and directly connected to it on the same shaft and bed plate. This shaft also carries a 200-K. W. generator of the direct-current type, shunt wound for 270 volts for operating the propelling motors.



THE FOAM BEGINS TO SHOW.

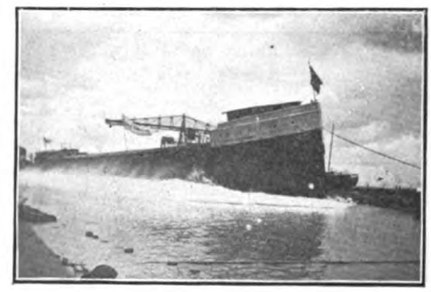
The Medill is constructed of steel throughout, practically no wood being used anywhere except for the inside finish of the deckhouse and pilothouse, and is 120 ft. over all, 109 ft. 6 in. between perpendiculars, 28 ft. molded beam, 15 ft. molded depth and will have a draught of about 9 ft. 6 in. A duplicate of the Medill will be launched by the Manitowoc Dry Dock Co. in a few weeks.



THE WAVE GROWS.

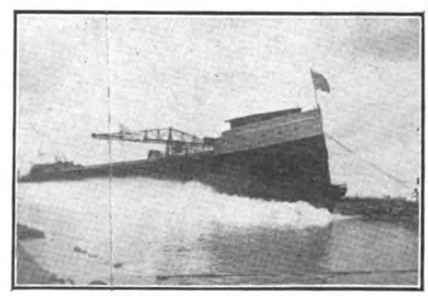
DRILL BOAT NO. 4.

The Great Lakes Dredge & Dock Co., Cleveland, O., launched their drill boat No. 4 at noon on Thursday last. The drill boat is entirely constructed of steel, and measures 135 ft. in length, 33 ft. beam and 7½ ft. in length. The spuds, drill frames, house are built entirely of steel. Drill frames and drills are all automatically operated. She was entirely assembled and built at the Great Lakes Dredge & Dock Co.'s yards, Cleveland. The special feature of this boat was that all machinery was installed before launching. The boat was christened by Miss Marie E. Kene. The Engineers' Club of Cleveland was represented, the American Society of Civil Engineers and marine interests. The boat is going to be placed in commission on section 1 of the Livingstone channel, Detroit river.



A MOMENT LATER.

The Imperial Gas Engine Co., 58-62 Clementina street, San Francisco, Cal., report that their business of manufacturing gasoline engines for boats has grown rapidly since the fire, business in both large and small powers being much increased since the disaster of 1906. The company has worked a full force during the entire depression that has followed the panic of last October and has only recently caught up with its orders. This would speak well for the type of engine manufactured by the company.



AT HER MAXIMUM LIST.

Generated on 2024-08-28 16:20 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

FOR THE LAKE MARINE

In this department hereafter will be found everything of current interest pertaining to Lake Navigation. Masters are advised to consult it weekly for information of interest to them; and owners are invited to use it freely for the promulgation of all announcements of a general nature. The Marine Review will be placed aboard every vessel having membership in the Lake Carriers' Association, representing a registered tonnage of nearly 2,000,000 tons, and can, therefore, be depended upon as a reliable courier to the entire fleet. It will reach every vessel in active service weekly. It is the intention to make this department complete so that at the end of the year it will be an authentic record which should prove of permanent and increasing value to owners and masters alike.

Mr. Harvey D. Goulder, counsel for the Lake Carriers' Association, has written the following opinion for the benefit of lake masters:

The following law was passed by the last congress and goes into effect on July 1:

"Any vessel of the United States subject to the provision of this title or to the inspection laws of the United States shall not be navigated unless she shall have in her service and on board such complement of licensed officers and crew as may, in the judgment of the local inspectors who inspect the vessel, be necessary for her safe navigation. The local inspectors shall make in the certificate of inspection of the vessel an entry of such complement of officers and crew which may be changed from time to t indorsement on such certificate cal inspectors by reason of cha conditions or employment. Suc or endorsement shall be subje right of appeal, under regulat be made by the secretary of co and labor, to the supervising i and from him to the supervi spector general, who shall h power to revise, set aside, o the said determination of the spectors.

"If any such vessel is dep the services of any member crew without the consent, faul lusion of the master, owner, person interested in the vessel, sel may proceed on her voya the judgment of the master sh ficiently manned for such vo

"If the master shall fail tc in writing such deficiency in to the local inspectors within of the time of the arrival of t at her destination, he shall to a penalty of $50. If th shall have been insufficiently in the judgment of the local i the master shall be liable to of $100, or in case of an i number of licensed officers, t alty of $500."

Briefly, if you are deprive services of any member of y called for in your inspection certificate, without the consent, fault or collusion of the master or owner, you may proceed on your voyage if, in your judgment, she is sufficiently manned for such voyage, making every effort to fill such vacancy during the voyage, but you must report to the local inspectors who issued your certificate within 12 hours of the time of arrival at your destination with a clean-cut statement of the facts in the case, and I should also like you to make a duplicate of your report to this office.

The manager of one of the leading fleets has sent the following letter in bulletin form to his masters:

"As a whole I [illegible]

and an opportunity for advancement, are not loyal to you and the interests which you represent, the quicker you weed them out and get men who have these qualifications the more successful you will be in making a good showing. Many men who quit working on the lakes four or five years ago are now returning and seeking employment. This should be encouraged if they are the right kind of men, as we must look to the future and surround ourselves with men who are ambitious for promotion."

LAKE FREIGHT SITUATION.

It takes an optimist to discover anything encouraging in the lake freight situation at present. Ore rates have sagged to 65 cents from the head of the lakes, and had it not been for decisive action on the part of a few leading shippers the rate probably would have broken to 60. Had the vessel interests stood firm the rate would undoubtedly have remained at 75 cents as the companies most concerned were quite willing to pay that rate provided all paid it. Some of the smaller ship-

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

PIG IRON SITUATION.

The beginning of the second half of the year finds the iron and steel industry in an improved position. Buying for the first half has been close to real needs, and stocks held over from the beginning of the depression have been generally absorbed. The railroads are showing signs of awakening interest, and are expected to increase their buying in the near future. Conservative interests, however, believe that while business may improve gradually, no decisive recovery may be expected before the closing months of the year. The past week has been an especially quiet one, with the exception of steel bar material. Extensive sales of cast iron pipe are noted in the central west, and good sized contracts for structural material in the New York district. While the demand for pig iron has fallen off somewhat, yet the prices of pig iron and coke are well maintained.

TUGS HARDING AND SABIN.

In the steel tugs Abner C. Harding and L. C. Sabin, the Great

as shown in the photograph, is quite interesting. The tugs are 81 ft. over all, 71 ft. keel, 21 ft. molded beam and 12 ft. 6 in. deep.

VIBRATION TEST OF FALLS HOLLOW STAYBOLT IRON.

Herewith is given a report of an average vibration test of eight samples of Falls Hollow staybolt iron made in the laboratory for testing materials at Purdue University by W. K. Hatt, professor of civil engineering and director, on May 7, last:

No.	Tension load, lbs. per sq. in.	Revolutions per minute.	Number of revolutions to rupture.
1	4,000	100	10,188
2	4,000	100	13,123
3	4,000	100	8 339
4	4,000	100	9,363
5	4,000	100	8,868
6	4,000	100	10,880
7	4,000	100	11,888
8	4,000	100	5,318
	Average.....		9,746

The tests were made on an Olsen staybolt machine in accordance with the specifications recommended by committee on staybolts of the American Society for Testing Materials.

These specifications include the following tensile strength: Not less than 48,000 lbs. per square inch; per cent of elongation in 8 in., not less than 28; per cent of contraction of area,

BOSTON MARINE NOTES.

Boston, July 1.—Contracts have been awarded the Fore River Shipbuilding Company for the construction of 3 steel car floats by the N. Y., N. H. & H. R. R. Co. They will be known as hulls number 167, 168 and 169, and are for the New England Navigation Company. According to the specifications these three car floats will be of the following dimensions: Molded length, 325 ft.; length over all, 327 ft. 3 in.; molded width amidships, 38 ft.; width over all amidships, 40 ft. 1 in.; depth of hold, molded amidships, 10 ft. 6 in.; depth at extreme ends from base line, 10 ft. 6 in.

The tug Underwriter left this port last week for a 1000-mile voyage to Louisburg, C. B., from which port she will tow back to Boston the fishing schooner Mooween, recently dismasted off Cape Race, N. F. The Mooween is owned by the New England Fish Company with headquarters on T wharf and although the long tow will be an immensely expensive undertaking the owners will sustain little or no loss owing to the fact that the vessel was insured against just such an accident.

freighting is still discouraging
ners of large sailing vessels in
cinity. Unchartered vessels are
ent accumulating in the differ-
ts along the New England sea-
with but little prospects of any
for the better in the situation
immediate future. Schooners
L. Drake and W. R. Huston
cured charters for coal cargoes
hiladelphia at the rate of 55
cents per ton respectively.

Boston Marine Society, a very
and representative organiza-
cked by the leading shipping
nsportation men of this port
act all along the New England
re preparing a petition which
r be sent to the war depart-
Washington asking the gov-
that "commencing at Hand-
lightship, there shall be a
seven-eighths of a mile wide
it nine miles long, with a uni-
oth of 30 ft., running straight
rtheast, magnetic direction.
three-quarters or more of
ed channel has now the nec-
epth and the remainder one-
more of the required depth."
etition asks for very essential
ssary improvements and will
npleted prove beneficial to Bos-
ther New England ports.

Generated on 2024-08-28 16:19 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ATLANTIC COAST GOSSIP

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The Lapland, a steamer being built for the Red Star Line service between Antwerp and New York, was successfully launched at the yards of Messrs. Harland & Wolff, Belfast, on June 27. The Lapland will be the largest vessel afloat under the Belgian flag when she goes into service, being 620 ft. long, of 18,000 tons register, with accommodations for 760 cabin and 1,700 steerage passengers. It is expected that she will be ready for service in November.

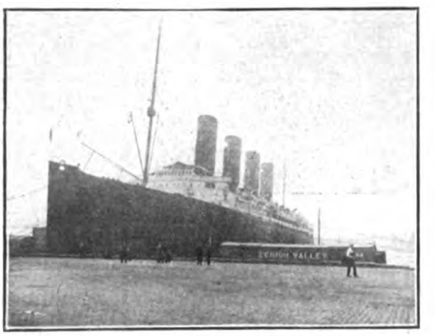
The Advisory Dock Commission of Newark, N. J., taking the first step toward making the city a port open to the commerce of the world, has sent to the Board of Works the following specific recommendations: To excavate a 16-ft. channel from the channel of the bay to the shore line, and to excavate the canal 350 ft. wide, 22 ft. deep and 3,400 or 4,000 ft. long. Under the plans more than 1,100 acres of meadow land are to be reclaimed and filled in with earth excavated from the canal. The maximum estimated cost is $10,795,600.

Shipments of ice from Maine to Philadelphia up to the present time aggregate 10,000 tons, against 4,500 tons for the corresponding period of 1907. The decline last year was largely due to high freights and the demand for tonnage in the coal-carrying trade.

On the last voyage of the Lusitania eastbound the passengers at a meeting aboard the ship passed resolutions asserting that at no time on the voyage was the vibrations of the steamer such as to interfere with their comfort, as has been charged at other times. The resolutions, which were signed by George H. Kinsolving, Bishop of Texas, on behalf of the passengers, had also many individual names attached.

The steamer Verona, the second new vessel of the recently inaugurated line between Philadelphia, Genoa and Naples, arrived at Philadelphia this week. The Verona, like her sistership Ancona, was built at Belfast for the Italian Steam Navigation Co. and designed especially for the United States-Mediterranean trade.

Three men were smothered to death in the hold of the steamer H. M. Whitney, of the Metropolitan Line, last week, while the vessel was lying at the foot of East 102d street, New York, where she was taken after coming off the rocks at Middle Reef. The men had gone down into the hold to help unload the remainder of the cargo, and were overcome by



THE LUSITANIA IN THE SLIPS.

poisonous gases engendered by the rotting cargo and putrid waters of the hold. The bodies were removed by divers.

The British steamer Huttonwood was driven ashore at Savannah, Ga., on June 25, by the violence of a sudden squall which bore down on the vessel while she was approaching Quarantine. She lay broadside in the stream for some time, but was eventually floated with the assistance of the tugs Cynthia and McCauley.

BOW VIEW OF LUSITANIA.

The Huttonwood was outward bound for Liverpool with a miscellaneous cargo valued at $846,897, and on being floated proceeded to sea.

The trans-Atlantic penny postage goes into effect on Oct. 1.

Capt. Krause, of the steamer Sibiria, of the Hamburg-American Line, reported, on his arrival at New York from West Indian ports, having picked up a New York boy who was drifting to sea in a boat off Norton's Point.

While picking her way through the fog along the coast of Long Island on the morning of June 24, the steamer Chippewa, bound north from Charleston, struck a rock about eight miles to the west of Montauk Point Lighthouse. She filled with water immediately, and lies about three hundred yards from the shore. The work of jettisoning the cargo is being proceeded with, but the chances of saving the vessel are very slight. The Chippewa is owned by the Clyde Line.

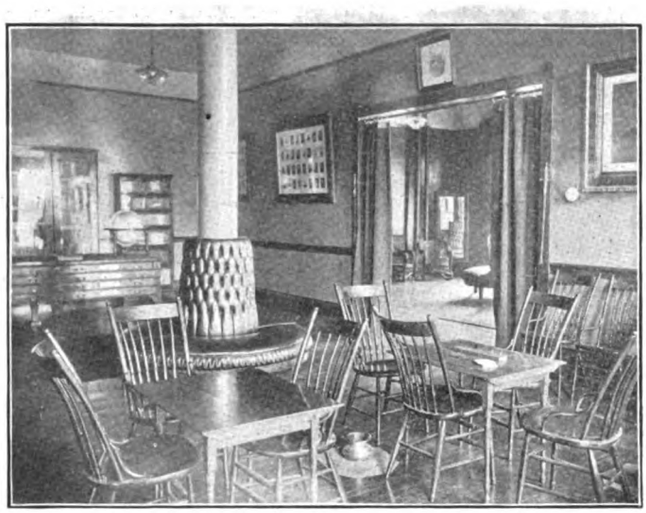
Even such requests for prayers from those who are going to travel by sea are considerably less frequent than twenty years ago.—Dr. Parkhurst. But just think how the boats have improved in that time, Charles.—*Indianapolis News.*

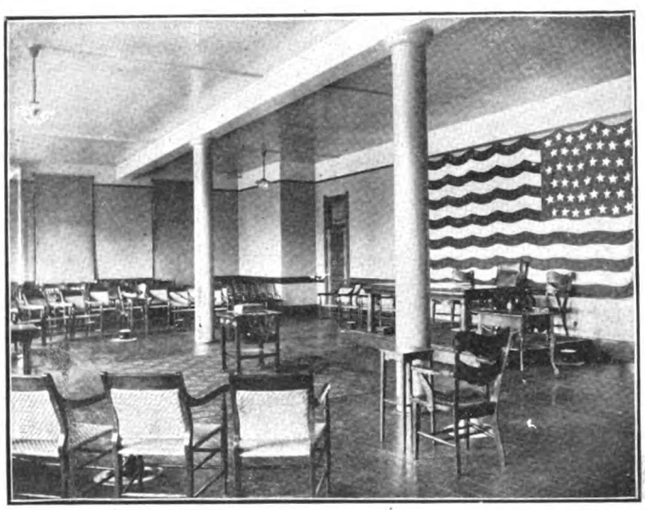
Captain Lorenzo Dow Baker, pioneer in the West India fruit trade, died at Boston last week. His first fruit was brought to Philadelphia on sailing vessels, one of which he was master. In 1870 Captain Baker went to Jamaica and recognizing the possibilities of the fruit trade some time afterward organized the Boston Fruit Company, of which he was the president until 1899. In that year the company became merged with the United Fruit Company, a $20,000,000 corporation, and Captain Baker became a director. He was prominent in the management of the Cuban Fruit Company, president of the Cape Cod Steamship Company and the Wellfleet Oyster Company.

The White Star Line announces to shippers that the temporary withdrawal of their cargo service between New York and Liverpool will in no way interfere with the prompt handling of all classes of cargo by their mail steamers, this service being maintained by the large and well known steamers Baltic, Geltic, Cedric and Arabic, sailing from New York every Thursday.

The stranger viewing the biggest Cunarders from across the street usually remarks, as he notes their tremendous bulk in comparison with the temporary shed erected for their especial benefit on the unfinished Chelsea pier, on the Hudson River, that things seem to be all out of proportion, somehow.

Generated on 2024-08-28 16:18 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN





FOUR PHOTOGRAPHS, SHOWING THE SPACIOUS QUARTERS OF CLEVELAND LODGE, SHIPMASTERS' ASSOCIATION.

The observation tower of the Singer building, New York, has been opened to the public. It is in the forty-second story, 548 ft. above the earth, and the view extends thirty miles in all directions. All of New York harbor and bay, and 'way out beyond the Hook is included in the area covered.

In the last 127 years Bath has built 904 full-rigged ships, 262 barques and barquentines, and 673 brigs. Of that fleet there are still in service 57 ships, 34 barques and 5 barquentines. Of the 57 surviving Bath ships, 5 fly the Norwegian flag, and one each the flags of Sweden, Turkey, Italy and Germany.

The schoolship Nautilus, the first Spanish naval vessel to enter a Cuban port since the relinquishment of Spanish sovereignty over the island, entered Havana harbor on the afternoon of June 24. She was well received, a fleet of close on 100 gaily decorated yachts and launches escorting her to her anchorage.

The new steamship Texas, built by the Newport News Shipbuilding Company, left on Saturday for her trial trip.

HEADQUARTERS OF CLEVELAND SHIPMASTERS' ASSOCIATION.

Herewith are presented four views of the rooms of the Cleveland lodge of the Shipmasters' Association. These rooms occupy the entire top floor of the large block on the corner of Superior and Seneca streets and were fitted up for the masters by James C. Wallace, president of the American Ship Building Co. They are very spacious and are undoubtedly the finest lodge rooms on the lakes. The assembly room will, in the winter season, be used by Cleveland vessel owners for such public gatherings as they may elect to hold.

Edgar Hull, fleet engineer of the United States Transportation Co., died at his home in Buffalo on Sunday morning last. He began his active career with the Anchor line in 1872. He left the lakes in 1894 but returned in 1901 as chief engineer of the Seneca and Oswego of the Lehigh Valley & Erie line. In 1904 he became fleet engineer for the United States Transportation Co.

Capt. Harris W. Baker succeeded in releasing the steamer Arundell from the rocks in the St. Lawrence river this week. The steamer is badly damaged and will be docked at Kingston.

The new steamer Price McKinney loaded her first cargo at Cleveland, this week, taking on 7,671 tons of coal.

Generated on 2024-08-28 16:22 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

The Upson-Walton Co.

CLEVELAND, OHIO

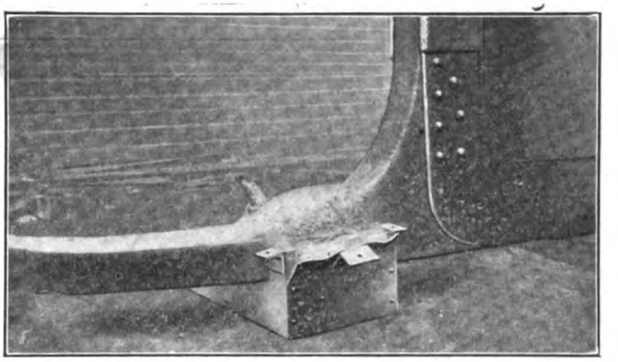
AMONG the first vessels that we fitted out was the Nellie Redington. That was nearly forty years ago, but the Nellie Redington is still afloat.

Among the latest vessels that we have fitted out is the Henry Phipps.

The Redington carries 1,500 tons; the Phipps, 12,000 tons.

As 1,500 is to 12,000 so is The Upson Walton Co. of thirty-six years ago to the Upson Walton Co. of today.

Our reputation as Outfitters of Vessels has grown year by year.



QUICK AND ECONOMICAL REPAIRS

No Dismantling of Vessel

We will contract for repairs on stern posts, rudder posts, crank shafts and other broken steel sections at any port in the United States. Send blue prints to any of our offices and an estimate will be promptly given.

Write for Pamphlet No. 18-E and learn of the many successful repairs to steamships that have been made by the Thermit Process.

GOLDSCHMIDT THERMIT COMPANY
90 WEST STREET, NEW YORK
432-436 Folsom St., San Francisco, Calif.
103 Richmond St. W., Toronto, Ont.

Geo. L. McCurdy

169 Jackson Boulevard
CHICAGO ILLINOIS

INSURANCE
HULLS and CARGOES

DIRECT REPRESENTATIVE OF LEADING AMERICAN AND FOREIGN UNDERWRITERS

MARINE SUPPLIES

We carry everything for fitting out vessels at our two stores
Buffalo and Duluth

GROCERIES
MEATS
ICE

THE GREAT LAKES SUPPLY CO. BUFFALO-DULUTH

CORDAGE
PAINTS
OILS

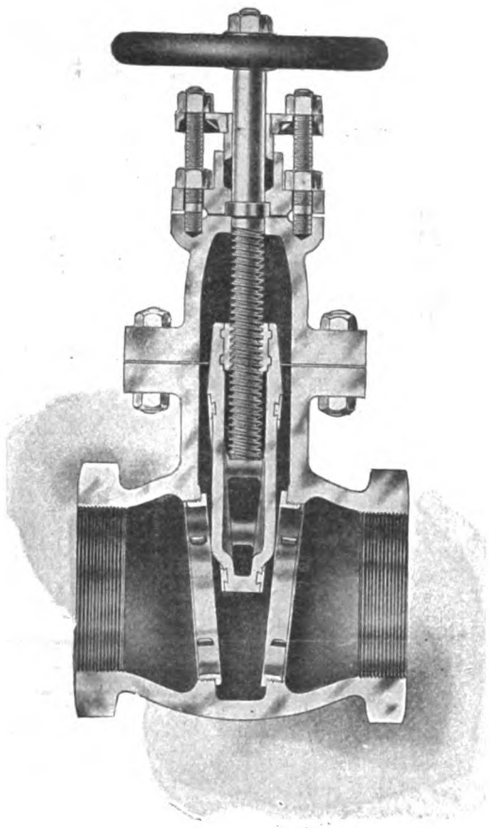
Engineers' Supplies
Launch Delivery Service

BUFFALO 11-13 Main St.
DULUTH 245-247 Lake Ave. So.

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

MEDIUM PRESSURE GATE VALVE.

For medium pressure steam or water service of all kinds the valve shown in the accompanying illustration is especially adapted, being designed by the makers, Jenkins Bros., New York, for a working pressure of 150 lbs., and



tested to 500 lbs. hydraulic pressure. The valve is of the double face, solid wedge type, the wedges being of cast iron faced with hard bronze rings and having grooves which slide smoothly on ribs in the body, preventing uneven wear of the faces or clattering when the valve is partly open. The body of the valve is of high grade cast iron, tapped and faced for seats at exactly the same angle as the wedges, the seat rings being made of hard bronze and screwed to shoulders on the body. These seats can be easily removed for truing up or renewal if necessary.

Either inside screw, stationary spindles, or outside screw, rising spindles can be supplied with the valves, the inside screws having spindles of bronze and the outside of steel. Bronze spindles, if desired, can be furnished with the outside screw valves. If required, extension spindles, gearing and other fittings can be furnished with the valve.

A flanged by-pass of special design, made with inside or outside screw and yoke to match the main valve is furnished, the use of by-passes being recommended on valves of 8 in. and larger. The by-pass body and elbows are combined in a single casting of special design secured to the main valve by a single flange. Thus the number of joints required are reduced to a minimum, and the general arrangement is strong and compact.

Engineers will appreciate the advantages of a valve which can be packed under pressure when wide open, no closing of the valve or shutting down of the steam line being necessary, as is possible with these gate valves, either stationary or rising spindle. The glands are made with a brass body screwed into malleable iron flange, all parts of the valves being renewable and thoroughly interchangeable.

TRADE NOTES.

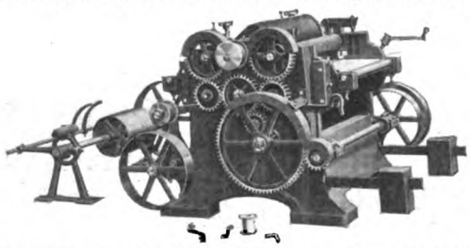
The General Fireproofing Co., Youngstown, will build an addition to its factory 60 by 200 ft. This building will be devoted to the manufacture of steel office furniture and filing devices, including steel sections or units, desks and tables. This furniture is finished to so closely resemble oak or mahogany that the difference cannot be detected by sight alone. Its advantages over wood are obvious.

The Norton Co., Worcester, Mass., has just issued a little catalog helpful to all who grind. It is a collection of "Don'ts" and certainly ought to be helpful to anyone who has grinding to do.

Work on the new $125,000 steel dock of the Manitowoc Dry Dock Co., at Manitowoc, Wis., is now under way and $25,000 worth of construction material is already on hand. The new dock will enable the company to handle the largest boats on the lake.

SEND FOR 1908 CATALOG OF
Crescent Wood-Working Machinery
The book contains a lot of valuable information that the intending buyer of machinery should have before selecting equipment. There are five new machines in the Crescent line. Catalog tells all about them.

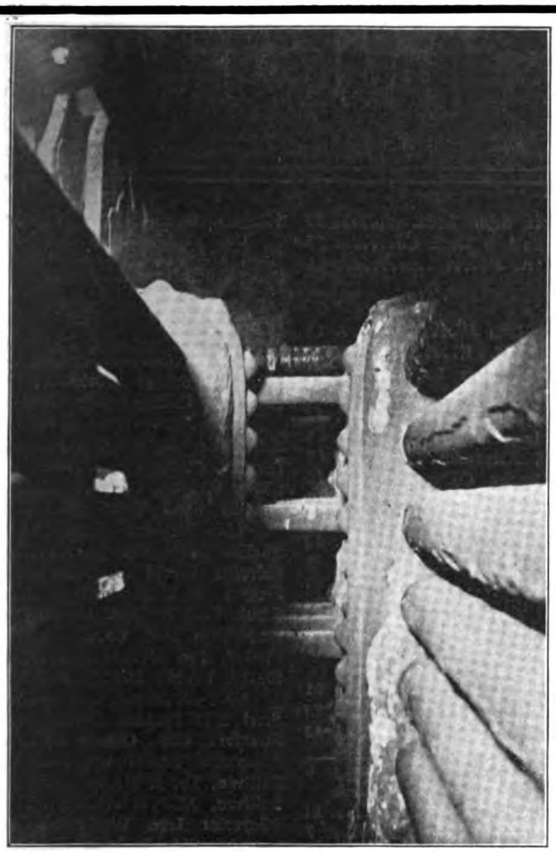
BAND SAWS
JOINTERS
SAW TABLES
SHAPERS



SWING SAWS
DISK GRINDER
BORING MACHINE
PLANER and MATCHER

26-inch Planer illustrated and described on pages 54 and 55 of 1908 catalog.
THE CRESCENT MACHINE CO., 27 Cherry St., Leetonia, O.

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN



Scale leaving the sheets of an old boiler after 3 months service of Rogers Purifiers

ROGERS'
Combination Steam Boiler Heater, Purifier, Oil Separator and Circulating Device

permits the operation of Marine Boilers from four to six months without cleaning. It is the cheapest and easiest to operate—absolutely safe and purely mechanical. Every one installed is a complete success.

USED BY

Steamers

Tuscarora
Bethlehem
Lighter Batavia
Gratwick
Northern Star
Northern Light
Minneapolis
Huron
Abraham Stearns
Henry B. Hawgood
Northland
Green
F. C. Ball
Stafford
Northwestern, N. Y.
Wm. B. Davock
Yale
Bradley
Mathew Andrews
Manteo
City of Erie
Sheldon Parks

New Steamers

American S. B. Co.
Hull No. 174
Hull No. 156
Castalia
Cillah
Ed. Smith
Heber Ward
City of Buffalo
Saranac
Wilkesbarre
P. P. Miller
Grecian
Northern King
North Wind
St. Paul
Chas. Hebard
Henry B. Smith
Neff
Hull No. 626
Hull No. 441
Hull No. 357
Hull No. 521
Hull No. 74
Hull No. 75
Hull No. 76
Hull No. 176
Great Lakes E. W.
Hull No. 31
Hull No 32
Hull No. 33
Hull No. 36
Hull No. 37
Hugh Kennedy
No. 3) at G. L. E. W.
L. C. Hanna
Myron
Buffalo (W. T. Co.)
Seneca
Mauch Chunk
Clyde
Corsica
Northern Queen
North Wave
Wm. Castle Rhodes
Capt. Thomas Wilson
J. Q. Riddle
Northwest
Hull No. 39
Hull No. 40
Hull No. 41
Hull No. 42
Hull No. 43
Toledo Ship Bldg. Co.
Hull No. 111
New York S. B. Co.
Camden, N. J.
3 Boilers No. 53
Newport News S.B.Co.
Tug Ganoga at N. Y.
Tug Mahanoy at N.Y.

STATIONARY PLANTS

Buffalo Dry Dock Co. Heubner Breweries Co. Chicago City Ry. Co.
Le Roy Salt Co. Shipowners Dry Dock Co.

In addition to the above we have many orders for early installation. Write for circulars.

Rogers, 202 Main St., Buffalo, N. Y.

HYDE WINDLASSES and CAPSTANS

The Hyde Steam and Power Windlasses and Capstans are the best in the market.

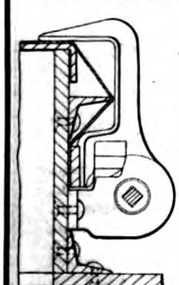
They have been selected for most of the vessels now building for the Navy Department, Revenue Marine, Lighthouse Board and United States Coast Survey.

They are being furnished for the majority of the highest class Steam Ships, Merchant Vessels and Yachts now building.

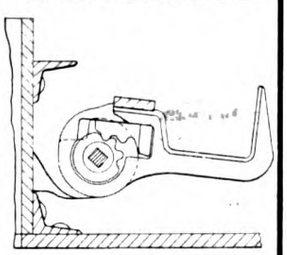
HYDE WINDLASS COMPANY, Bath, Maine.

PECKHAM'S AUTOMATIC

Hatch Cover Fastener



Only fastener ever made that automatically locks and fastens in one movement. Lever operated either singly or together.



EASILY ATTACHED TO ANY HATCH

Write for particulars to

ORTEN P. PECKHAM, River Rouge, Mich.

REILLY MULTICOIL

High Permanent Efficiency of the Reilly Multicoil Feed Water Heater

High efficiency because the scientific and practical requirements for the rapid absorption of heat are fully embodied in our construction.

Permanent efficiency because there can be no lodgement of scale or sediment in the tubes to prevent the rapid transfer of heat.

These and many other striking advantages of the Reilly Multicoil Heater are fully discussed and explained in our new catalogue.

Copies free upon request.

The GRISCOM-SPENCER COMPANY

(Formerly, The JAMES REILLY REPAIR & SUPPLY CO.)

General Offices, 90 West Street, New York

SHOPS:

Jersey City---Pier B, North River, adjoining Penna. R. R terminal.
Philadelphia---Ft. of Washington Ave., Delaware River, Room 1024 Real Estate Trust Building.
Supply Department---229 West Street, New York City.

REILLY MULTICOIL

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

ADVERTISERS

The Star indicates alternate insertions, the Dagger once a month.

Admiral Anchor Co..... 11
Almy Water Tube Boiler Co... 67
†American Balance Valve Co.. 13
American Injector Co..... 17
American Line 81
American Ship Building Co... 4
American Ship Windlass Co... 2
Armstrong Cork Co..... 79
Anderson, Gilbert 79
Asbestos Composition Flooring Co. 2
†Ashton Valve Co..... 12
Atlantic Works 82
†Atlantic Works, Inc..... 12

Babcock & Penton..... 81
Baker, Howard H., & Co..... 66
Belcher, Fred P..... 80
Boland & Cornelius..... 80
*Boston & Lockport Block Co.. 69
†Boucher Mfg. Co., The H. E. 9
Bowers, L. M., & Co..... 69
Breymann, G. H., & Bros..... 77
Briggs, Marvin 66
†Brown Hoisting Machinery Co. 3
Buffalo Dredging Co..... 77
Buffalo Dry Dock Co..... 5
Bunker, E. A..... 84

C. & B. Transit Co..... 64
Chase Machine Co..... 71
Chicago Ship Building Co..... 4
Clark Wireless Telegraph & Telephone Co. 16
Clemente, C. 64
Cleveland City Forge & Iron Co. 82
Collingwood Ship Building Co.. 9
†Columbian Rope Co..... 16
Continental Iron Works..... 2
Cook's Sons, Adam 73
Copeland Co., E. T..... 67
Cory, Chas., & Son..... 82
Coston Signal Co., Inc..... 15
Cowles, Benj. L..... 66
Cramp, Wm., & Sons, S. & E. B. Co..... 8
†Crescent Machine Co..... 13
Curr, Robert 81

Dake Engine Co..... 3
Delany, P., & Co..... 67
Detroit Ship Building Co..... 4
Dixon, Joseph, Crucible Co.... 73
Donnelly Salvage & Wrecking Co. 79
Douglas, G. L., Jr..... 80
Drein, Thos., & Son..... 79
Dunbar & Sullivan Dredging Co. 77

Ekenberg Milk Products Co.... 15
Ekstrom, G..... 81
Elphicke, C. W., & Co..... 80
†Empire Ship Building Co.... 81

Falls Hollow Staybolt Co..... 65
Fix's, S., Sons..... 82
Fletcher, W. & A., Co..... 82
Fogg, M. W..... 79
Fore River Ship Building Co.. 82
Furstenau, M. C..... 81

General Electric Co..... 84
Gilchrist, Albert J..... 80
†Goldschmidt Thermit Co..... 61
Goulder, Holding & Masten... 81
Great Lakes Dredge & Dock Co. 77
Great Lakes Engineering Wks. 18
Great Lakes Register..... 76
†Great Lakes Supply Co..... 61
*Great Lakes Towing Co..... 76
Griscom-Spencer Co. 63

Hall, John B..... 80
Hanna, M. A., & Co..... 75
Hascall Paint Co..... 16
Hawgood, W. A., & Co..... 80
Hayward Co., The..... 14
Helm, D. T., & Co..... 80
Holmes, Samuel 80
Hoyt, Dustin & Kelly..... 80
Hunt, Robert W., & Co..... 81
Hutchinson & Co..... 80
Hyde Windlass Co..... 63
Hyner, P. D..... 80

†Ideal Pump Governor Co..... 65
Industrial Law League..... 73
International Mercantile Marine Co. 81

Jenkins Brothers 84
Jenkins, Russell & Eichelberger 80
Johnston Brothers 67

Kahnweiler's Sons, David..... 79
Katzenstein, L., & Co..... 69
Kidd, Joseph 81
Kingsford Foundry & Machine Works 67
Kremer, C. E..... 80

*Le Mois Scientifique..... 73
Lorain Coal & Dock Co..... 75
Lundin, A. P..... 84

Manistee Iron Works Co..... 65
McCarthy, T. R..... 80
McCurdy, George L..... 61
MacDonald, Ray G..... 80
*Marine Iron Co..... 82
Marine Iron Works 83
Marshall, Alexander 80
Martin-Barriss Co. 76
Maryland Steel Co..... 10
Mehl, Edward 80
Michigan Lubricator Co..... 12
Milwaukee Dry Dock Co..... 5
Mitchell & Co..... 80
Monitor Oil Co..... 73
Morse, A. J., & Son..... 79

Nacey & Hynd..... 81
National Cork Co..... 79
National Tube Co..... 13
Newport News Ship Building & Dry Dock Co..... 6
New York Mallet & Handle Works 81
New York Ship Building Co... 7
†Nicholson Ship Log Co..... 9
Northern Dredge Co..... 77
Nugent & Co., Wm. W..... 73

O'Connor, J. J..... 80
Otis Steel Co..... 82

Parker Bros. Co..... 80
Peckham, O. P..... 63
Penberthy Injector Co..... 84
Pickands, Mather & Co..... 75
Pittsburg Coal Co..... 75

Quintard Iron Works Co..... 65

Richardson, W. C..... 80
*Ritchie, E. S., & Sons..... 73
Roberts Safety Water-Tube Boiler Co. 67
Roelker, H. B..... 79
†Rogers Steam Oil Separator Co. 63
Root, W. O..... 81
Ross Valve Co..... 82

Safety Car Heating & Lighting Co. 3
†Samson Cordage Works..... 17
Scherzer Rolling Lift Bridge Co. 14
Schrader's, A., Sons, Inc..... 79
†Seneca Chain Co..... 17
Shaw, Warren, Cady & Oakes. 80
*Shelby Steel Tube Co..... 13
(See National Tube Co.)
Sheriffs Mfg. Co..... 69
Shipping World 76
Siggers & Siggers..... 79
Smith Coal & Dock Co..... 75
Smooth-On Mfg. Co..... 83
Speddy, Jos. H..... 80
Starke, C. H., Dredge & Dock Co. 77
Steel Mill Packing Co..... 69
Stratford, Geo., Oakum Co..... 76
Submarine Signal Co..... 15
Sullivan, D., & Co..... 80
Sullivan, M. 77
†Superior Iron Works..... 71
Superior Ship Building Co..... 4

Thornycroft & Co., Ltd., John I. 69
Tietjen & Lang Dry Dock Co.. 9
*Toledo Fuel Co..... 75
Toledo Ship Building Co..... 5
Trout, H. G..... 69
Truscott Boat Mfg. Co..... 16

Under-Feed Stoker Co. of America 73
Upson-Walton Co. 61

Vance & Joys Co..... 80

Walker, Thomas, & Son..... 17
*Watson-Stillman Co. 83
Wilby, Carlton 81
Wilcox, Peck & Hughes..... 66
Wood, W. J..... 81

SAWDOLET

is a plastic substance, about the consistency of mortar when applied but hardening rapidly into an indestructible monolithic flooring, impervious to dust, water or fire.

It makes a substantial flooring for ships or for general flooring. It sticks to iron, brick or wood.

SAWDOLET

Sawdolet can be colored any tint to meet any decorative scheme in joiner work.

The following lake steamers have been fitted with Sawdolet:

J. J. Sullivan, D. R. Hanna, James B. Morrow, M. Andrews, L. S. DeGraff, W. M. Mills, The Odonah, Crete, Cyprus, Adriatic, Verona J. G. Morse, Elba, C. W. Kotcher, B. F. Berry, John Dunn, Jr., J. J. H. Brown, Wm. H Truesdale, W. H. Wolff, A. E. Nettleton, John A. Donaldson, Americans, car ferry Marquette and Bessemer No. 2, Douglas Houghton, William Edenborn and Queen City.

C. CLEMENTE, Sole Owner

1722 Oregon Ave. Cleveland, Ohio

THE CLEVELAND & BUFFALO TRANSIT COMPANY

UNPARALLELED NIGHT SERVICE

The Twin Flyers of The Lakes

"CITY OF BUFFALO" "CITY OF ERIE"

Both together being, without doubt, in all respects the finest and fastest that are run in the interest of the traveling public in the United States.

TIME CARD.—DAILY INCLUDING SUNDAY. CENTRAL STANDARD TIME.

Leave CLEVELAND 8 p. m. Arrive BUFFALO 6:30 a. m.
" BUFFALO 8 p. m. " CLEVELAND 6:30 a. m.

Connections made at Buffalo for all Eastern and Canadian points; at Cleveland for Toledo, Detroit and all points West and Southwest. **Tickets reading over L. S. & M. S. Ry. will be accepted on this Company's Steamers without extra charge.** Special Low Rates Cleveland to Buffalo and Niagara Falls every Saturday Night, also Buffalo to Cleveland. Ask Ticket Agents for tickets via C. & B. Line. Send four cents for illustrated pamphlet.

W. F. HERMAN, G. P. A., Cleveland, O.

Generated on 2024-08-28 16:19 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

Quintard
Iron Works Company

Office 742 E. 12th St.
NEW YORK

MARINE ENGINES, BOILERS
MARINE TURBINES

Gas Works Apparatus,
Sugar, Cement, Mining, Dredging
and all kinds of Machinery.

N. F. PALMER, President
STEVENSON TAYLOR, Vice Pres.
GEO. Q. PALMER, Treas. and Genl. Mgr.

FALLS HOLLOW STAYBOLT BARS
ANY SIZE, OUTSIDE OR INSIDE DIAMETER.
AVERAGE LENGTH OF HOLLOW BARS EIGHT TO TEN FEET.
BOTH HOLLOW AND SOLID.
MADE OF BEST QUALITY DOUBLE REFINED CHARCOAL IRON OR STEEL.
FALLS HOLLOW STAYBOLT Co
CUYAHOGA FALLS, O. U.S.A.

Staybolts are dangerously reduced in strength in the process of tell-tale drilling

HOLLOW STAYBOLTS

have the tell-tale hole rolled in the bar.

IN SERVICE

renders absolute safety and great endurance.

Send for Important Literature and Prices.

FALLS HOLLOW STAYBOLT CO., Cuyahoga Falls, Ohio
STAYBOLT IRON A SPECIALTY.

THE
DEAL
Automatic Pump Governor

Is the quickest acting, most sensitive, efficient and durable pump governor made. It never sticks, clogs, corrodes nor collects sediment. The only governor working successfully on Salt Water.

Made throughout of the best Steam Bronze. Approved by the National Board of Supervising Inspectors of Steam Vessels.

Write for Catalog.

The Ideal Automatic Pump Governor Co.

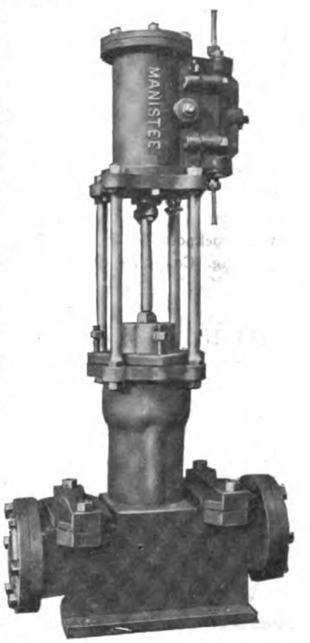
15-25 Whitehall St., New York City

Manistee Iron Works Co.
Manistee, Mich.

Builders of Marine Engines and Boilers of any size. Also all styles of pumps for every service, Single and Duplex.

We run a general repair shop doing work from the smallest to the largest, in Machine Shop, Foundry and Boiler Shop.

This upright Bilge Pump fills a long felt want, it being guaranteed to pump coal up to 1¼-inch diameter. Also small sticks, dirt or anything ordinarily found in bilge water will not stop the valves as in the ordinary duplex pump used for this work.



This photograph of the "MANISTEE" Upright Bilge Pump shows the 6-inch x 6-inch x 10-inch stroke pump. We make these pumps either upright or horizontal, in any of the following sizes:

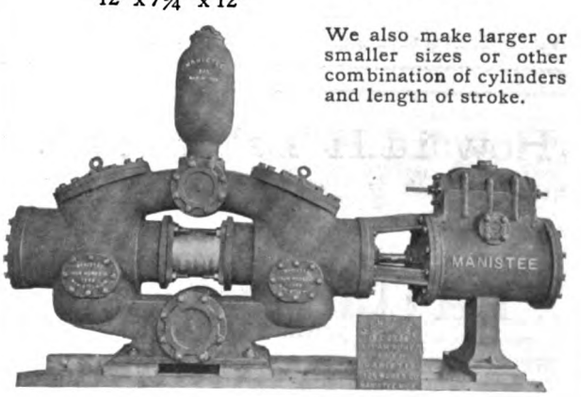
4″ x 4″ x 6″
5″ x 5″ x 8″
6″ x 6″ x 10″
8″ x 8″ x 12″
10″ x 10″ x 12″
12″ x 12″ x 12″

We also make larger sizes and other combination of cylinders or longer stroke to suit special requirements and floor space. They can also be made at any angle to fit on skin of boat if required.

This photograph of the "MANISTEE" Centrally Packed Plunger Pump shows the 18-inch x 12-inch x 24-inch pump. We make these pumps in the following sizes:

4″ x 2⅜″ x 5″
5″ x 3 ″ x 6″
6″ x 3⅝″ x 8″
7″ x 4 ″ x 8″
8″ x 5 ″ x 10″
10″ x 6 ″ x 12″
12″ x 7¼″ x 12″
14″ x 8″ x 12″
16″ x 10″ x 18″
18″ x 12″ x 24″
20″ x 14″ x 24″
24″ x 16″ x 24″
30″ x 18″ x 24″

We also make larger or smaller sizes or other combination of cylinders and length of stroke.



All of our pumps can be made with compound cylinders, if required.

Generated on 2024-08-28 16:15 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN

CLASSIFIED ADVERTISING SERVICE

FOR SALE, MISCELLANEOUS.

NEAFIE & LEVY F & A COMpound 26"-50" x 30" with Surface Condenser and Pumps. Will alter to 22"-50" x 30" for high steam.

13½ K. W. Electric Lighting Set.

Williamson Steering Engine.

Two Hawser Pullers (Capstans).

Two Providence Steam Windlasses.

Wheeler Surface Condenser.

Blake Vertical Duplex Air Pump and Jet Condenser. 7½" steam, 16" air, 12" stroke.

Worthington Duplex Air Pump & Jet Condenser 9" x 12" x 10".

D. C. Sturtevant Blower & Engine.

Two Scotch Boilers 12' x 12'.

Two Scotch Boilers 11' x 12'.

Two Scotch boilers 13½' x 12'.

MARVIN BRIGGS, INC.,
154 Nassau Street, New York.

SHIP DRAFTSMEN WANTED. Pay $2.00 to $5.04 per diem. An examination will be held July 14, 1908, for the purpose of establishing eligible register for ship draftsmen and assistant ship draftsmen. For application and further information address, "President of the Examining Board for ship draftsmen, Bureau of Construction and Repair, Navy Department, Washington, D. C.

STEAMERS FOR SALE.

FREIGHT AND PASSENGER steamer for sale, 500 gross tons. Allow 600 excursionists. Will sleep 75 night passengers. Address Box 123, THE MARINE REVIEW, Cleveland, O.

PROPOSAL

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., June 30, 1908. Sealed proposals for Repair of South Pier at Grand Haven, Mich., will be received here until 3 P. M., July 14, 1908, and then publicly opened. Information on application. M. B. Adams, Col., Engrs.

U. S. Engineer Office, Milwaukee, Wis., June 26, 1908. Sealed proposals for dredging at Manitowoc Harbor, Wis., will be received here until 2 P. M., July 16, 1908, and then publicly opened. Information on application. W. V. Judson, Major, Engrs.

U. S. Engineer Office, Jones Building, Detroit, Mich., June 18, 1908. Sealed proposals for dredging Hay Lake and Neebish Channels, Saint Marys River, Michigan, will be received at this office until 3 P. M., July 21, 1908. Information on application. C. McD. Townsend, Lt. Col., Engrs.

U. S. Engineer Office, Jones Building, Detroit, Mich., June 17, 1908. Sealed proposals for furnishing and delivering at St. Marys Falls Canal, Michigan, about 1,328,000 feet B. M. of hemlock timber will be received at this office until 3 P. M., July 17, 1908, and then publicly opened. Information on application. C. McD. Townsend, Lt. Col., Engrs.

ENGINES FOR SALE

FOR SALE CHEAP. MARINE ENgine 24 in. x 26 in., also marine boiler, 7 x 17 ft. Both in good condition. Address C. M. Moiles, Saginaw, Mich.

STEAM YACHT FOR SALE

STEAM YACHT FOR SALE. GOOD condition. Originally cost $25,000.00. Twelve berths, kitchen, mahogany finish, beautifully decorated. Has compound engine 10 x 20; good boiler, electric lights. Dimensions 83 feet long, 14 feet wide, 9 feet deep. A very staunch craft. Would make good yacht to cruise on Great Lakes. On account death of owner must be sold for less than cost of boiler and engine. Address Box 130, the MARINE REVIEW, Cleveland, Ohio.

CLAM SHELL BUCKETS FOR SALE

ONE TWO YARD WILLIAMS clam shell bucket for sale; also one 1¼-yard Williams clam shell bucket. E. M. Graves, 17 Commercial Bank Bldg., Cleveland, O.

DERRICK FOR SALE

M'MYLER DERRICK FOR SALE. All complete to handle clam bucket. E. M. Graves, 17 Commercial Bank Bldg., Cleveland, O.

WILLCOX, PECK & HUGHES
Average Adjusters **Insurance Brokers**
3 South William Street
NEW YORK

HULLS AND CARGOES

We place insurances in the most advantageous markets, and have unequaled facilities for procuring, in the interests of our clients, the best obtainable rates and terms from the strongest Foreign and Home companies.

BRANCHES:
Cleveland **Chicago** **Buffalo** **Minneapolis**
Boston **Seattle** **New Orleans**

Represented by
C. T. BOWRING & CO., (Insurance) LTD.
Winchester House and at "Lloyd's", London
WE REPRESENT THE ASSURED

Howard H. Baker & Co.

BUFFALO, N. Y.

HATCH COVERS

Made of

Wilford's

Waterproof Flax Duck

Wreck for Sale

Steamer Vega and Cargo ashore on South Fox Island, Lake Michigan. Hull and Machinery about 1400 tons. Cargo 2100 tons ore. Engine, fore and aft 27 and 50 x 36. Two boilers, 9 feet diameter, 14 feet long.

Address
O. G. DONALDSON
50 South Division Street, BUFFALO, N. Y.

Cheap for Cash

FOR SALE
PASSENGER STEAMER HULL
110 ft. long, 18 ft. beam, 6 draft.
Suitable for house boat.
BENJAMIN L. COWLES
BUFFALO, N. Y. Ship Yards 265-271 Elk St.

FOR SALE
4 Sea Going Suction Hopper Dredges

Capable of dumping at sea or pumping ashore without alteration. One of 1,500 cu. yards hopper capacity. Three of 500 cu. yards hopper capacity each.
Built of iron and in first-class condition; fully equipped with modern machinery, electric lighting, etc.

Address, C. L. CRANDALL,
307 Trust Bldg. Galveston, Texas

Generated on 2024-08-28 16:16 GMT / https://hdl.handle.net/2027/mdp.39015043584435
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from UNIVERSITY OF MICHIGAN